VERIFICATION REPORT

ME "KHARKIVSKY TEPLOVI MEREZHI"

VERIFICATION OF THE REHABILITATION OF THE DISTRICT HEATING SYSTEM IN KHARKIV CITY

PERIODIC 2008

BUREAU VERITAS CERTIFICATION

REPORT NO. UKRAINE- VER#/0032/2009

REVISION NO. 01

VERIFICATION REPORT

Date of first issue:	Organizational unit:
31/03/2009	Bureau Veritas Certification Holding SAS
Client:	**Client ref.:**
ME “Kharkivsky teplovi merezhi”	Mr. Sergey Andreev

Summary:

Bureau Veritas Certification has made the verification of the **“Rehabilitation of the District Heating System in Kharkiv City”** project of ME “Kharkivsky teplovi merezhi” located in Kharkiv, Ukraine on the basis of UNFCCC criteria for the JI, as well as the host country criteria and criteria given to provide for consistent project operations, monitoring and reporting, as well as the host country criteria.

The verification scope is defined as a periodic independent review and ex post determination by the Designated Operational Entity of the monitored reductions in GHG emissions during defined verification period, and consisted of the following three phases: i) desk review of the Monitoring Report, Pproject Ddesign Document and the baseline and monitoring plan; ii) follow-up interviews with project stakeholders; iii) resolution of outstanding issues and the issuance of the final verification report and opinion. The overall verification, from Contract Review to Verification Report & Opinion, was conducted using Bureau Veritas Certification internal procedures.
The first output of the verification process is a list of Clarification Requests, Corrective Actions Requests, Forward Actions Requests (CL, CAR and FAR), presented in Appendix A.

In summary, Bureau Veritas Certification confirms that the project is implemented as planned and described in validated project design documents. Installed equipment being essential for generating emission reduction runs reliably and is calibrated appropriately. The monitoring system is in place and the GHG emission reduction is calculated without material misstatements.

Our opinion relates to the project’s GHG emissions and resulting GHG emissions reductions reported and related to the valid project baseline and monitoring, and its associated documents. Based on information seen and evaluated we confirm that the implementation of the project has resulted in **296089.1** t CO2e reductions during period from 01/01/2008 up to 31/12/2008.

On the behalf of verification team, Flavio Gomes, the Bureau Veritas Certification Holding SAS Global Product Manager for Climate Change, approved final version of the Verification Report and it is signed by Ivan Sokolov authorized Bureau Veritas Certification Holding SAS Local product manager for Climate Change in Ukraine.

Report No.:	Subject Group:
UKRAINE- VER#/2009	JI

Project title:
Rehabilitation of the District Heating System in Kharkiv City

Work carried out by:

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Date of this revision:	Rev. No.:	Number of pages:
31/03/2009	01	63

Indexing terms

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Abbreviations change / add to the list as necessary

AIE	Accredited Independent Entity
BVCH	Bureau Veritas Certification Holding SAS
CAR	Corrective Action Request
CER	Certified Emission Reductions
CL	Clarification Request
CO_2	Carbon Dioxide
DOE	Designated Operational Entity
FAR	Forward Action Request
GHG	Green House Gas(es)
IETA	International Emissions Trading Association
JI	Joint Implementation
JISC	JI Supervisory Committee
MoV	Means of Verification
MP	Monitoring Plan
PCF	Prototype Carbon Fund
PDD	Project Design Document
UNFCCC	United Nations Framework Convention on Climate Change
DH	District Heating

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1 INTRODUCTION

ME “Kharkivski teplovi merezhi” has commissioned Bureau Veritas Certification to verify the emissions reductions of its JI project "Rehabilitation of the District Heating System in Kharkiv City" (hereafter called “the project”) in Kharkiv, Ukraine, UNFCCC JI Reference Number 0150.
This report summarizes the findings of the second verification of the project, performed on the basis of criteria given to provide for consistent project operations, monitoring and reporting, and contains a statement for the verified emission reductions.
The order includes the second periodic verification of the project. Report is based on the Periodic Verification Report Template Version 3.0, December 2003, both part of the Validation and Verification Manual (VVM) published by International Emission Trading Association (IETA).
Second periodic verification has been performed with the account of findings and conclusions of the integral initial and first periodic verification report No. UKRAINE- VER#/2008 version 01 dated 26/12/2008.
The results of the determination were documented by "Climate and Energy" of TÜV Süddeutschland in the report: "Determination of the “Rehabilitation of the District Heating System in Kharkiv City” JI-Project, Ukraine", Report No. 1201751 dated 2008, December 16th. The changed monitoring plan was determined during initial verification (BVCH report No. UKRAINE- VER#/2008).

Project is approved by the National Agency of Ecological Investments in Ukraine and Ministry of Economical Affairs in Netherlands. (Letters of Approval are presented)

1.1 Objective

Verification is the periodic independent review and ex post determination by the AIE of the monitored reductions in GHG emissions during defined verification period.
The objective of verification can be divided in Initial Verification and Periodic Verification.
Initial Verification: The objective of an initial verification is to verify that the project is implemented as planned, to confirm that the monitoring system is in place and fully functional, and to assure that the project will generate verifiable emission reductions. A separate initial verification prior to the project entering into regular operations is not a mandatory requirement.

Periodic Verification: The objective of the periodic verification is to verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan; furthermore the periodic verification evaluates the GHG emission reduction data and express a conclusion with a high, but not absolute, level of assurance about whether the reported GHG emission reduction data is free of material misstatements; and verifies that the reported GHG emission data is sufficiently supported by evidence, i.e. monitoring records. If no prior initial verification has been carried out, the objective of the first periodic verification also includes the objectives of the initial verification.
In general, the verification follows UNFCCC criteria referring to the Kyoto Protocol criteria, the JI/CDM rules and modalities, and the subsequent decisions by the JISC, as well as the host country criteria.

1.2 Scope

Verification scope is defined as an independent and objective review and ex post determination by the Designated Operational Entity of the monitored reductions in GHG emissions. The verification is based on the submitted monitoring report and the determinated project design document including the project's baseline study and monitoring plan and other relevant documents. The information in these documents is reviewed against Kyoto Protocol requirements, UNFCCC rules and associated interpretations. Bureau Veritas Certification has, based on the recommendations in the Validation and Verification Manual employed a risk-based approach in the verification, focusing on the identification of significant risks of the project implementation and the generation of ERUs. The verification is not meant to provide any consulting towards the Client. However, stated requests for forward actions and/or corrective actions may provide input for improvement of the project monitoring towards reductions in the GHG emissions.
The audit team has been provided with a Monitoring Report version 2 and underlying data records, covering the period 01 January 2008 to 31 December 2008 inclusive.

1.3 GHG Project Description

The project main goal is fuel consumption reduction, in particular reduction of natural gas (which is imported to Ukraine) and coal consumption, by means of district heating system rehabilitation in Kharkiv City, including boiler and distribution network equipment replacement and rehabilitation, installation of combined heat and power production plants and frequency controllers. Such reduction of fuel consumption will result in decrease of greenhouse gas emissions (CO_2 and N_2O). The purpose of

the project is sustainable development of the region through implementation of energy saving technologies.
Municipal Enterprise (ME) "Kharkivski teplovi merezhi" is one of the main enterprises in field of production and distribution of the heat energy in Kharkiv City. It sells heat energy in forms of heat, hot water and steam, to local consumers, namely households, municipal consumers and state-owned organizations. Besides ME "Kharkivski teplovi merezhi", heat energy is produced by CHP-5 and CHP-3 stations, which have no their own distribution network, but have consumers, with which they have signed contracts for heat energy supply. Therefore they forced to have contractual relations with ME "Kharkivski teplovi merezhi" concerning to heat energy distribution to their consumers. Surplus of produced heat energy is sale to ME "Kharkivski teplovi merezhi". Heat supply market in the region is stable for years.
The project was initiated in 2004 to rehabilitate Kharkiv City's district heating system, including boiler and distribution network equipment replacement and rehabilitation, and installation of combined heat and power production plants (CHP) as well as frequency controllers. Project includes 277 boiler-houses with 610 boilers, CHP-4 station and 1411,5 km of heat distributing networks, that are managed by ME "Kharkivski teplovi merezhi".
Project provides installation of cogeneration units at boiler houses of Salkivskiy Living Area (KSZHM). At that time there are two companies considered as potential candidates for installation their cogeneration units – JSC "Pervomaiskdieselmash" (Ukraine) - 3 gas engine-generator machines DvG1A-630, with total capacity 1890 kW_e, or „Caterpillar" (USA) - 2 engine-generator machines G3516 of 1060 kW each..
CHP-4 does not produce electricity in present. The electricity production ended in 1983, and there are no scheduled measures for plant reconstruction except frequency controllers installation. Only networks that distribute heat from CHP-4 are scheduled to be replaced within the project, and load from several boiler-houses will be switched to it. The frequency controller has been installed in 2008.
The project employs the increase in fuel consumption efficiency to reduce greenhouse gas emissions relative to current practice. Over 157.3 million Nm^3 of natural gas and 354 ton of coal will be saved annually starting from 2012. Such reduction of fuel consumption is based on increase of the boiler efficiencies, reduction of heat losses in networks and CHP and frequency controllers installation. The following activities will ensure fuel saving:
Replacement of old boilers by the new highly efficient boilers;
Switching of load from boiler-houses with obsolete equipment to modern equipped boiler houses and CHP plants and units.
Switching of boiler-houses from coal to natural gas;
Improving of the network organization;

Estimated project annual reductions of GHG emissions, in particular CO_2, are from 4.1 thousand tons to 12.6 thousand tons in 2005 – 2007, from 61.3 thousand tons to 187.1 thousand tons in 2008 – 2010, and over 300 thousand tons per year starting from 2011 comparing to business-as-usual or baseline scenario.

Implementation of the project will provide substantial economic, environmental, and social benefits to the Kharkiv city. Social impact of the project is positive since after project implementation the heat supply service will be improved.
Environmental impact of the project is expected to be very positive as emission of the exhaust gases such as CO_2, NO_x, and CO will be reduced. Also due to better after-implementation service, some part of population will cease to use electric heaters thus reducing electricity consumption, which is related to power plants emissions of CO_2, SO_x, NO_x, CO and particulate matter.

ME "Kharkivski teplovi merezhi" fulfils 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.

Estimated project risks are limited and minimized. Ukraine has claimed district heating and municipal energy sector as a priority of the national energy-saving development.

2 METHODOLOGY

The verification is as a desk review and field visit including discussions and interviews with selected experts and stakeholders.

In order to ensure transparency, a verification protocol was customized for the project, according to the Validation and Verification Manual (IETA/PCF) a verification protocol is used as part of the verification. The protocol shows, in a transparent manner, criteria (requirements), means of

verification and the results from verifying the identified criteria. The verification protocol serves the following purposes:
It organises, details and clarifies the requirements the project is expected to meet; and
It ensures a transparent verification process where the verifier will document how a particular requirement has been verified and the result of the verification;

The verification protocol consists of one table under Initial Verification checklist [if applicable] and four tables under Periodic verification checklist. The different columns in these tables are described in Figure 1.

The overall verification, from Contract Review to Verification Report & Opinion, was conducted using Bureau Veritas Certification procedures.

The completed verification protocol is enclosed in Appendix A to this report.

Initial Verification Protocol Table 1			
Objective	**Reference**	**Comments**	**Conclusion (CARs/FARs)**
The requirements the project must meet	Gives reference to where the requirement is found.	Description of circumstances and further comments on the conclusion	This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR) of risk or non-compliance of the stated requirements. Forward Action Request (FAR) indicates essential risks for further periodic verifications.

Periodic Verification Checklist Protocol Table 2: Data Management System/Controls		
Identification of potential reporting risk	**Identification, assessment and testing of management controls**	**Areas of residual risks**
The project operator's data management system/controls are assessed to identify reporting risks and to assess the data management system's/control's ability to mitigate reporting risks. The GHG data management system/controls are assessed against the expectations detailed in the table.	A score is assigned as follows: • Full - all best-practice expectations are implemented. • Partial - a proportion of the best practice expectations is implemented • Limited - this should be given if little or none of the system	Description of circumstances and further commendation to the conclusion. This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR) of risk or non compliance with stated requirements. The corrective action requests are numbered and presented to the client in the verification report. The Initial Verification has additional Forward Action Requests (FAR). FAR indicates essential risks for further periodic verifications.

	component is in place.	

Periodic Verification Protocol Table 3: GHG calculation procedures and management control testing		
Identification of potential reporting risk	**Identification, assessment and testing of management controls**	**Areas of residual risks**
Identify and list potential reporting risks based on an assessment of the emission estimation procedures, i.e. ➢ the calculation methods, ➢ raw data collection and sources of supporting documentation, ➢ reports/databases/information systems from which data is obtained. Identify key source data. Examples of source data include metering records, process monitors, operational logs, laboratory/analytical data, accounting records, utility data and vendor data. Check appropriate calibration and maintenance of equipment, and assess the likely accuracy of data supplied. Focus on those risks that impact the accuracy, completeness and consistency of the reported data. Risks are weakness in the GHG calculation systems and may include: ➢ manual transfer of data/manual calculations, ➢ unclear origins of data, ➢ accuracy due to technological limitations, ➢ lack of appropriate data protection measures? For example, protected calculation cells in spreadsheets and/or password restrictions.	Identify the key controls for each area with potential reporting risks. Assess the adequacy of the key controls and eventually test that the key controls are actually in operation. Internal controls include (not exhaustive): ➢ Understanding of responsibilities and roles ➢ Reporting, reviewing and formal management approval of data; ➢ Procedures for ensuring data completeness, conformance with reporting guidelines, maintenance of data trails etc. ➢ Controls to ensure the arithmetical accuracy of the GHG data generated and accounting records e.g. internal audits, and checking/ review procedures; ➢ Controls over the computer information systems; ➢ Review processes for identification and understanding of key process parameters and implementation of calibration maintenance regimes ➢ Comparing and analysing the GHG data with previous periods, targets and benchmarks. When testing the specific internal controls, the following questions are considered: 1. Is the control designed properly to	Identify areas of residual risks, i.e. areas of potential reporting risks where there are no adequate management controls to mitigate potential reporting risks Areas where data accuracy, completeness and consistency could be improved are highlighted.

	ensure that it would either prevent or detect and correct any significant misstatements? 2. To what extent have the internal controls been implemented according to their design; 3. To what extent have the internal controls (if existing) functioned properly (policies and procedures have been followed) throughout the period? 4. How does management assess the internal control as reliable?	

Periodic Verification Protocol Table 4: Detailed audit testing of residual risk areas and random testing		
Areas of residual risks	**Additional verification testing performed**	**Conclusions and Areas Requiring Improvement (including Forward Action Requests)**
List the residual areas of risks (Table 2 where detailed audit testing is necessary. In addition, other material areas may be selected for detailed audit testing.	The additional verification testing performed is described. Testing may include: 1. Sample cross checking of manual transfers of data 2. Recalculation 3. Spreadsheet 'walk throughs' to check links and equations 4. Inspection of calibration and maintenance records for key equipment ➢ Check sampling analysis results ➢ Discussions with process engineers who have detailed knowledge of process uncertainty/error bands.	Having investigated the residual risks, the conclusions should be noted here. Errors and uncertainties should be highlighted. Errors and uncertainty can be due to a number of reasons: ➢ Calculation errors. These may be due to inaccurate manual transposition, use of inappropriate emission factors or assumptions etc. ➢ Lack of clarity in the monitoring plan. This could lead to inconsistent approaches to calculations or scope of reported data. ➢ Technological limitations. There may be inherent uncertainties (error bands) associated with the methods used to measure emissions e.g. use of particular equipment such as meters. ➢ Lack of source data. Data for some sources may not be cost effective or practical to collect. This may result in the use of default data which has been derived based on certain assumptions/conditions and which will therefore have varying applicability in different situations. The second two categories are explored with the site personnel, based on their knowledge and experience of the processes. High risk process parameters or source data (i.e. those

		with a significant influence on the reported data, such as meters) are reviewed for these uncertainties.

Verification Protocol Table 5: Resolution of Corrective Action and Clarification Requests			
Report clarifications and corrective action requests	**Ref. to checklist question in tables 2/3**	**Summary of project owner response**	**Verification conclusion**
If the conclusions from the Verification are either a Corrective Action Request or a Clarification Request, these should be listed in this section.	Reference to the checklist question number in Tables 2, 3 and 4 where the Corrective Action Request or Clarification Request is explained.	The responses given by the Client or other project participants during the communications with the verification team should be summarized in this section.	This section should summarize the verification team's responses and final conclusions. The conclusions should also be included in Tables 2, 3 and 4, under "Final Conclusion".

Figure 1 Verification protocol tables

2.1 Review of Documents

The Monitoring Report (MR) version 2 submitted by ME "Kharkivski teplovi merezhi" and additional background documents related to the project design and baseline, i.e. country Law, Project Design Document (PDD) version 04, Monitoring Plan, applied methodology, Kyoto Protocol, Clarifications on Verification Requirements to be Checked by a Designated Operational Entity were reviewed.

The verification findings presented in this report relate to the project as described in the PDD version 04 and Project Monitoring Report version 2 for the year 2008.

2.2 Follow-up Interviews

On 16/03/2009 Bureau Veritas Certification performed interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. Representatives of ME „Kharkivski teplovi merezhi" were interviewed (see References). The main topics of the interviews are summarized in Table 1.

Table 1 Interview topics

Interviewed organization	Interview topics
ME „Kharkivski teplovi merezhi”	Organizational structure. Responsibilities and authorities. Training of personnel. Quality management procedures and technology. Rehabilitation /Implementation of equipment (records). Metering equipment control. Metering record keeping system, database.
Consultant: Institute of Engineering Ecology	Baseline methodology. Monitoring plan. Monitoring report. Deviations from PDD.

2.3 Resolution of Clarification, Corrective and Forward Action Requests

The objective of this phase of the verification is to raise the requests for corrective actions and clarification and any other outstanding issues that needed to be clarified for Bureau Veritas Certification positive conclusion on the GHG emission reduction calculation.

Corrective Action Requests (CAR) are issued, where:
i) there is a clear deviation concerning the implementation of the project as defined by the PDD;
ii) requirements set by the MP or qualifications in a verification opinion have not been met; or
iii) there is a risk that the project would not be able to deliver (high quality) ERUs.

Forward Action Requests (FAR) are issued, where:
iv) the actual status requires a special focus on this item for the next consecutive verification, or
v) an adjustment of the MP is recommended.

The verification team may also use the term Clarification Request (CL), which would be where:
vi) additional information is needed to fully clarify an issue.

To guarantee the transparency of the verification process, the concerns raised are documented in more detail in the verification protocol in Appendix A.

3 VERIFICATION FINDINGS

In the following sections, the findings of the verification are stated. The verification findings for each verification subject are presented as follows:
1) The findings from the desk review of the original project activity documents and the findings from interviews during the follow up visit are summarized. A more detailed record of these findings can be found in the Verification Protocol in Appendix A.
2) The conclusions for verification subject are presented.

The discussions and the conclusions that followed the preliminary verification report and possible corrective action requests are encapsulated in this section.

3.1 Remaining issues CAR's, FAR's from previous determination

One task of verification is to check the remaining issues from the previous validation or issues which are clearly defined for assessment in the PDD. The initial and first periodic verification report, prepared by Bureau Veritas Certification Holding SAS, does not note any open issue.

3.2 Project Implementation

3.2.1 Discussion

The project main goal is fuel consumption reduction, in particular reduction of natural gas (which is imported to Ukraine) and coal consumption, by means of district heating system rehabilitation in Kharkiv City, including boiler and distribution network equipment replacement and rehabilitation, installation of combined heat and power production plants and frequency controllers. Such reduction of fuel consumption will result in decrease of greenhouse gas emissions (CO_2 and N_2O). The purpose of the project is sustainable development of the region through implementation of energy saving technologies.
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own distribution network, but have consumers, with which they have signed contracts for heat energy supply. Therefore they forced to have contractual relations with ME "Kharkivski teplovi merezhi" concerning to heat energy distribution to their consumers. Surplus of produced heat energy is sale to ME "Kharkivski teplovi merezhi". Heat supply market in the region is stable for years.

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CHP-4 does not produce electricity in present. The electricity production ended in 1983, and there are no scheduled measures for plant reconstruction except frequency controllers installation. Only networks that distribute heat from CHP-4 are scheduled to be replaced within the project, and load from several boiler-houses will be switched to it. The frequency controller has been installed in 2008.

The project employs the increase in fuel consumption efficiency to reduce greenhouse gas emissions relative to current practice. Over 157.3 million Nm^3 of natural gas and 354 ton of coal will be saved annually starting from 2012. Such reduction of fuel consumption is based on increase of the boiler efficiencies, reduction of heat losses in networks and CHP and frequency controllers installation. The following activities will ensure fuel saving:

- Replacement of old boilers by the new highly efficient boilers;
- Switching of load from boiler-houses with obsolete equipment to modern equipped boiler houses and CHP plants and units.
- Switching of boiler-houses from coal to natural gas;
- Improving of the network organization;

According to the project activities the following measurement equipment was implemented:

Switch load to other boiler houses and CHP	25

Carrying out of boiler house from basement with gas furnace plant organizing	
AOGV-96	11
AOGV-50	2
KS-G-100	4
Kolvitherm	2
Ferolly	4
Furnace plant organizing	
KGB-100	3
AOGV-50	2
Liquidation or reconstruction of heating points	5
Replacement of boilers	
VK-21	5
KGB-1	2
AOGV-20	2
KBNG-3,15	3
RTQ 600	7
RTQ 200	1
RTQ 165	7
RTQ 100	11
RTQ 130	5
R3300.63	3
RTQ 300	3
RTQ 700	1
RTQ 350	1
Total	79
Network replacement, m	75860

Measurement equipment is in place and calibrated. All required metering systems have been identified and checked on the sampling basis. The following meters are relevant for the calculation of emission reductions:

GMS-G-10 .... GMS-616-32	Produced by "Arsenal" plant Kiev city
ВРСГ-1	Produced by "Electroprylad" Kazan

	city
BK-011	Produced by "Energooblik" Kharkiv city
LG-K-80...200	Produced by Ivano-Frankivsk plant JSC "Promprylad"
RGK-100 ... 1000	Produced by Ivano-Frankivsk plant JSC "Promprylad"
RGK-40 ... 400	Produced by Ivano-Frankivsk plant JSC "Promprylad"
BK-610-T	Produced by Dnipropetrovsk city-Czechia
DELTA G-16	Produced in Slimburzhe city, France
Corrector КПЛГ-2.01	Produced by "Radmirteh" Kharkiv city
Corrector КПЛГ-1.02	Produced by "Radmirteh" Kharkiv city
Corrector METRIX-66	Produced in Czechia

Used meters are within their calibration period. They comply with the appropriate standards.

The Monitoring Plan defines the responsibilities to consolidate the data required for emission reduction calculations. Calculations are transparent and restricted to entering annually the production data into a predefined Excel spreadsheet.

3.2.2Findings

CAR 1

Explain more detail what “Improving of the network organization” means.

Response

Improvement of the heat networks system organization is provided by liquidation of Heat Distribution Stations (HDS) with replacing 4-pipe lines by 2-pipe ones with simultaneous installation of heat exchangers directly at the consumers (Individual Heating Point – IHP), or reconstruction of HDS with modern lower capacity heat exchangers installation (reduction of necessary power will be realizable due to switching of part of power to IHP). It is enable to liquidate 46 km of pipes with different diameters, to reduce heat losses and to reduce power consumption for power supply of circulation pumps. Technical characteristic of new heat exchangers (see fig. 1) are presented on the producer’s website http://teploenergo.com.ua

Fig. 1 New heat exchangers

CAR 2

Explain operation principle of device for automatic control of natural gas consumption.

Response

ME "Kharkivski teplovi merezhi" uses correctors of gas flue meters “RADOMIR”, see fig. 2.

Fig. 2 Automatic system “RADOMIR”

Flowing readings are taken from correctors of gas flue meters “RADOMIR”

- readings of gas flue meter numerator;
- current readings of gas flue meter at the corrector;
- difference of readings of gas flue meter and corrector;
- average daily average overpressure of gas;
- average daily temperature of gas;
- digital value of factor condensability;
- digital value of correction factor to standard conditions;
- daily volume of gas (standard conditions);
- accumulate volume of gas per month (standard conditions)

3.2.3 Conclusion

The project complies with the requirement.

3.3 Internal and External Data

3.3.1 Discussion

The 20 parameters should be monitored according to the Monitoring Plan but considering that implementation of CHP units at ME “Kharkiv teplovi merezhi” and have not been finished yet. The CO2 emissions reduction due to power production was excluded according to the principle of conservatism. So two parameters presented in the table below have not been monitored and excluded.

18	Scheduled electric power production
19	Scheduled heat energy production

The 18 parameters are monitored within the projects but only one of them (volume of natural gas consumption) is measured directly. The remaining monitoring parameters used in calculation of the baseline and project line emissions are taken as statistic data.

The following parameters need to be obtained according to the monitoring plan:

- Fuel consumption at boiler-houses (for natural gas and coal in 1000 m^3 and t manually recorded every day)
- Average annual Heating Value of fuel (MJ/m^3 for natural gas, MJ/t for coal, data are provided by natural gas suppliers usually monthly, quality certificate is given by coal supplier's for every consignment)
- Average outside temperature during the heating season (^0C (K), recorded every day of heating season)
- Average inside temperature during the heating season (^0C (K), recorded once per heating season)
- Number of Customers (Contracts with population, organizations and legal entities are concludes directly with ME "Kharkivski teplovi merezhi". They are updated once per year.)
- Heating area (total, m^2, the information is collected at the sale departments of ME "Kharkivski teplovi merezhi" by the certificates of owners in accordance with technical passport of building.)
- Average heat transfer factor of heated buildings in the base year (W/m^2*K, heat transfer factor is recorded ones per year

at recording of connection or disconnection of any heating area to boiler-houses included in project)
- Heating area of buildings (previously existed in the base year) with the renewed (improved) thermal insulation in the reported year (m^2, once per year)
- Heating area of newly connected buildings (assumed with the new (improved) thermal insulation) in the reported year (m^2 , once per year)
- Heat transfer factor of buildings with the new thermal insulation (W/m^2*K)
- Duration of the heating period (hours, once per year)
- Duration of the hot water supply period (hours, once per day)
- Maximum connected load to the boiler-house, that is required for heating (MW, once per year)
- Connected load to the boiler-house, that is required for hot water supply service (MW, once per year)
- Standard specific discharge of hot water per personal account (kWh/h, once per year)
- Carbon emission factor (for natural gas and coal kt CO_2/TJ once per year)
- Recalculating factor for average load during heating period (once per year)
- Electric power consumption, (Electric power consumption was measured at the boiler houses and CHP, in the heating area of which reconstruction and liquidation of HDS will take place, HDS that will be reconstructed and liquidated, boiler houses and HDS, where frequency controllers will be installed.)

In fact records are taken every 2 hours (manually) or semi-continuously, where correctors are present (electronically), and after that manual daily summarizing record is performed. In both cases (manual or semi-continuous) monitoring is within the PDD where records are required every 2 hours. The records are maintained on daily and annually basis, the boiler operation is statutory, so the chances of misstatement in the records are hereby low.

The director of ME "Kharkivski teplovi merezhi", Mr. Sergiy Andreev, appointed the responsible person, Mr. Andriy Repin, for the implementation and management of the monitoring process at the ME "Kharkivski teplovi merezhi". Mr. Andriy Repin is responsible for supervising of data collection, measurements, calibration, data recording and storage.
In addition the developers of the project are responsible for baseline and monitoring methodology development and data processing. In particularly:

Dr. Vladimir Gomon, Managing Engineer of European Institute for safety, security, insurance and environmental techniques, is responsible for baseline and monitoring methodology development.
Dr. Dmitri Paderno, vice director of Institute of Engineering Ecology, is responsible for baseline and monitoring methodology development.
Ms. Tetiana Grechko, senior engineer of Institute of Engineering Ecology, is responsible for baseline and monitoring methodology development and data processing.

The external data used are following:

Average annual Heating Value of Natural Gas was approximately 34,6 MJ/ m3 during 2008 year.

Average annual Heating Value of Coal was approximately 19 MJ/t during 2008 years.

Daily outside temperature during the heating season is calculated by ME "Kharkivski teplovi merezhi" from the daily outside temperature values taken by dispatcher of ME "Kharkivski teplovi merezhi" from Kharkiv Meteorological Centre from 10 to 11 a.m. every day of heating season.

For calculation of Heat transfer factor of buildings for every boiler-house, the method of Weighted average value was used, that depends on heating area of existing buildings and heating area of the new buildings. Values of the heat transfer factor for existing buildings were taken from SNiP 2-3-79 (1998) - not higher than 0.83. Values of the heat transfer factor of new buildings were taken according to State Buildings Norms (B.2.6-31:2006) - not higher than 0.36.

Heat transfer factor of new buildings and buildings with new thermal insulation - Not higher than 0.36, according to State Buildings Norms (B.2.6-31:2006)

Standard specific discharge of hot water per personal account - standard specific discharges of hot water per personal account for different types of consumers are presented in “KTM 204 Ukraine 244-941”.

Carbon emission factor for different fuels, which is determinated in PDD and is confirmed in the Monitoring Report 2 for the year 2008 without deviations.

- Cef (natural gas) = 0.0561 $ktCO_2/TJ$
- Cef (coal) = 0.0946 $ktCO_2/TJ$; (taken as “Other bituminous coal”).

3.3.2 Findings

None

3.3.3 Conclusion

The project complies with the requirements.

3.4 Environmental and Social Indicators

3.4.1 Discussion

No environmental and social indicators are defined in the monitoring plan. Implementation of project "Rehabilitation of the District Heating System of Crimea" ha a positive effect on environment. Following points give detailed information on environmental benefits.

1. Project implementation allowed to save over 166 million Nm^3 of natural gas, over 334 ton of coal and 17358 ths. kWh of power during 2008.
2. Due to fuel economy and new environmentally friendlier technologies of fuel combustion, project implementation reduced emissions of SO_x, NO_x, CO and particulate matter (co-products of combustion).

There are no negative social impacts associated with the project.

The auditor team on site met a sample of local stakeholders. They expressed their deep appreciations for the project. As per them the project has brought sustainable development in to the Kharkiv City through implementation of energy saving technologies, as well as improving of living comfort through improving of heat and hot water supply service quality and reliability.

3.4.2 Findings

None

3.4.3. Conclusion

The project complies with the JI requirements as well as with the local requirements.

3.5 Management and Operational System

3.5.1 Discussion

In order to ensure a successful operation of a Client project and the credibility and verifiability of the emissions reductions achieved, the project must have a well defined management and operational system.
The ME "Kharkivski teplovi merezhi" complies with all legal and statutory requirements of the Ukrainian Government and the same were made available to the verification team. Appropriate procedures reflect commitment in management and operational control. Job descriptions, technological instructions are in place. Calibration and maintenance procedures are followed according statutory requirements of Ukraine.

3.5.2 Findings

None

3.5.3 Conclusion

The Monitoring Report and the Management and Operational Systems are eligible for reliable project monitoring.

4 SECOND PERIODIC VERIFICATION FINDINGS

4.1 Completeness of Monitoring

4.1.1 Discussion

The reporting procedures reflect the monitoring plan completely. It is confirmed that the monitoring report does comply with the monitoring methodology and PDD.
The 20 parameters should be monitored according to Monitoring Plan but considering that implementation of CHP units at ME "Kharkivski teplovi merezhi" have not been finished yet CO2 emissions reduction calculations by power production was not carried out according to the principle of conservatism. So two parameters presented in the table below have not been monitored.

18	Scheduled electric power production (was not take into consideration)
19	Scheduled heat energy production (was not take into consideration)

All parameters were determined as prescribed. The complete data is stored electronically and documented. The necessary procedures have been defined in internal procedures and additional internal documents relevant for the determination of the 18 parameters listed in the monitoring plan.
Project participants provided necessary documents for the verification – Project Design Document version 8 (PDD) and Monitoring Report version 4 (MR). Emission reductions for monitoring period 2005-2007 were

expected to be 85911,0 t CO2e. According to the Monitoring Report the emission reductions achieved 453358,6 t CO2e. (Table 1)

Table1 Summarized amount of emissions and emission reductions for 2005-2007 (t CO2e)			
Baseline emissions according to MR	Factual project emissions according to MR	Project emission reductions according to MR	Project emission reductions according to PDD
6450894,7	5993931,2	456963,5	24179,9

MR – Monitoring Report
PDD – Project Design Document

It must be taken into account that emission reductions is the difference between the baseline emissions, which are calculated according to the determined methodology with the use of particular data for each year, and project emissions, which are achieved during the project activity after implementation of the planned measures in the particular year. (Table 2). This difference is 10-14% from the baseline, which is rather sensitive for the different factors impact.

Table2 Emissions and emission reductions inyears (t CO2e)			
Year	Baseline emissions according to MR	Factual project emissions according to MR	Project emission reductions according to MR
2005	2182966,3	2082053,7	99970,5
2006	2205545,2	2053604,6	150472,3
2007	2122530,1	1914038,3	206520,7

MR – Monitoring Report

The conducted analysis showed that the difference between the amount of emission reductions in PDD and MR was caused by the cumulative impact of several factors:

1. PDD was developed for the commitment period of the Kyoto Protocol for 2008-2012. Emission reductions till 2008 were forecasted with a high level of uncertainty and in accordance with the slow implementation of the planned measures during 2004-2009.
2. Calculations of the baseline scenario were conducted according to the specific methodology, which means that baseline scenario in PDD is just an assumption.
3. Determination is based on the conservative approach, which means that the least favorable scenario is taken into consideration with the future ability to prove emission reductions.
4. Heat characteristics (factors) of the fuel, which is used, really differ from the ones used in the calculation process in PDD.
5. The amount of fuel consumption is not steady. It depends on seasonal and annual climate fluctuations. This fact influences the baseline and the amount of emission reductions (fuel expenditure is decreasing during warm winters in Kharkiv, and the GHG emission

reductions amount is less then while the boilers are working fulltime).

6. Equipment and measures were implemented faster than it was planned in PDD. It is mentioned in PDD that proper measures and equipment would be implemented till 2009, however real implementation was conducted during 2004-2007, while near 50 % of the measures before 2005. The list of the measures implemented:
    - Replacement of old boilers by the new highly efficient boilers;
    - Upgrading of boilers' burners for the combustion improvement;
    - Switching of boiler-houses from fuel oil to natural gas;
    - Improving of the network organization;
    - Application of the new insulation and the pre-insulated pipes;
    - Installation of heat-utilizers;
    - Replacement of old boiler houses by new ones;

Hence, verified emission reductions in years during 2005-2007 approached to the annual emission reductions forecasted in PDD starting from 2008-2009. (Table 3)

Table 3 Forecasted and factual emission reductions in years (t CO2e)

Year	Project emission reductions according to PDD	Project emission reductions according to MR
2004	0	
2005	4116,9	99970,5
2006	7513,3	150472,3
2007	12549,7	206520,7
2008	61289,5	296089,1
2009	122328,4	
2010	187125,3	
2011	302096,0	
2012	328503,1	
2013	328503,1	
2014	328503,1	
2015	328503,1	
2016	328503,1	
2017	328503,1	
2018	328503,1	
2019	328503,1	
2020	328503,1	
2021	328503,1	
2022	328503,1	
2023	328503,1	

* Emission reductions according to MR for the next monitoring period 2008.

4.1.3 Conclusion

The project complies with the requirements.

4.2 Accuracy of Emission Reduction Calculations

4.2.1 Discussion

Due to the methodology corrections for data uncertainty should be made. The audit team confirms that emission reduction calculations have been performed according to the Monitoring Plan and to the calculation methodology reported in the Section D.3.4. of the Monitoring Report version 2.
Possible uncertainties and errors for such type project may arise from two main reasons: measurement and stipulation. Measurement error 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 error may be introduced. The stipulation error itself may be estimated based on the expected accuracy of the stipulated values.

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

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

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

Although the project has 18 monitoring parameters, only one of them (volume of natural gas consumption) is measured directly. The remaining monitoring parameters 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 year parameters ratio. For example, temperature change factor is calculated as ratio of inside and outside temperature differences in reported and base years: $K_2 = (T_{in\ r} - T_{out\ r}) / (T_{in\ b} - T_{out\ b})$. Therefore any error in statistic data will be cancelled.

The volume of natural gas consumption measurement errors which impact the Standard Error and their level of accuracy are: ± 1.0 % (usual value for the majority of meters).

Corresponding metered values of natural gas consumption, according to the conservatizm principle, are corrected by accuracy of meters.

4.2.2 Findings

None

4.2.3 Conclusion

All requested corrections have been considered in the Monitoring Report version 2. The project complies with the requirements.

4.3 Quality Evidence to Determine Emissions Reductions

4.3.1 Discussion

Concerning verification the calculation of emission reductions is based on internal data. The origin of those data was explicitly checked. Further on, entering and processing of those data in the monitoring workbook Excel sheet was checked where predefined algorithms compute the annual value of the emission reductions. All equations and algorithms used in the different workbook sheets were checked. Inspection of calibration and maintenance records for key equipment was performed for all relevant meters.
Necessary procedures have been defined in internal procedures and additional internal documents relevant for the determination of the various parameters on daily basis.

4.3.2 Findings

None

4.3.3 Conclusion

The project complies with the requirements.

4.4 Management System and Quality Assurance

4.4.1 Discussion

The general director of ME "Kharkivski teplovi merezhi", Mr. Sergiy Andreev, appointed the responsible person, Mr. Andriy Repin, for the implementation and management of the monitoring process at the ME "Kharkivski teplovi merezhi". Mr. Andriy Repin is responsible for supervising of data collection, measurements, calibration, data recording and storage.

As far as the main activity of ME "Kharkivski teplovi merezhi" will not change in course of the JI project implementation, the special technical trainings for personnel are not necessary. The technical personnel of the enterprise has sufficient knowledge and experience for implmentation of the project activity and maintenance of the usual equipment.
In cases of the new (never used at this enterprise before, for example: cogeneration units, foreign produced boilers, etc.) equipment installation, the company - producer of this equipment should provide trainings for personnel.
For example, JSC "Pervomaiskdieselmash" – the producer of cogeneration units – during all period of operation of engines-generators usually renders to purchaisers of their equipment all kinds of service:
Performance mounting, starting-up and adjustment works, commissioning;
Training of the attendants on service regulations at object of the customer or at industrial base of a factory;
Guarantee and after guarantee service;
Performance on place of operation maintenance service;
Performance on place of operation current, average and major overhauls, including on vessels without their conclusion from operation.

ME "Kharkivski teplovi merezhi" provides personnel retraining according to protection of labor norms. The enterprise has the Labor protection department, which is responsible for raising the level of personnel skills and trainings.

In course of the JI project development (starting from 2004), specialists of Institute of Engineering Ecology and then also of the European Institute for safety, security, insurance and environmental technics carried out a comprehensive consultations and trainings for involved representatives of ME "Kharkivski teplovi merezhi" on the necessary data collection according to Monitoring plan for the project.
The special training is scheduled to be held before the development of the Monitoring report, in January, 2009.

The special group was organized consisted of representatives of ME "Kharkivski teplovi merezhi" and Institute of Engineering Ecology, in particular:
Sergiy Andreev - ME "Kharkivski teplovi merezhi", Director;
Andriy Repin - ME "Kharkivski teplovi merezhi", Chief of Production-Technical Service;
Roman Zinchenko - ME "Kharkivski teplovi merezhi", Deputy chief of Production-Technical Service;
Tetiana Grechko - Institute of Engineering Ecology, senior engineer;
Dmitri Paderno - Institute of Engineering Ecology, vice director.

The responcible stuff of the Production-Technical Service of ME "Kharkivski teplovi merezhi" is involved in this process.

4.4.2 Findings

None

4.4.3 Conclusion

The project complies with the requirements.

5 PROJECT SCORECARD

Risk Areas		Conclusions			Summary of findings and comments
		Baseline Emissions	Project Emissions	Calculated Emission Reductions	
Completeness	Source coverage/ boundary definition	✓	✓	✓	All relevant sources are covered by the monitoring plan and the boundaries of the project are defined correctly and transparently.
Accuracy	Physical Measurement and Analysis	✓	✓	✓	State-of-the-art technology is applied in an appropriate manner. Appropriate backup solutions are provided.
	Data calculations	✓	✓	✓	Emission reductions are calculated correctly
	Data management & reporting	✓	✓	✓	Data management and reporting were found to be satisfying.
Consistency	Changes in the project	✓	✓	✓	Results are consistent to underlying raw data.

6 SECOND PERIODIC VERIFICATION STATEMENT

Bureau Veritas Certification has performed a verification of the JI project “Rehabilitation of the District Heating System Rehabilitation in Kharkiv City”. The verification is based on the currently valid documentation of the United Nations Framework Convention on the Climate Change (UNFCCC).

The management of the ME “Kharkivski teplovi merezhi” is responsible for the preparation of the GHG emissions data and the reported GHG

emissions reductions of the project on the basis set out within the project Monitoring and Verification Plan indicated in the final PDD version 4. The development and maintenance of records and reporting procedures in accordance with that plan, including the calculation and determination of GHG emission reductions from the project is the responsibility of the management of the project.

Bureau Veritas Certification verified the Project Monitoring Report version 2 for the reporting period as indicated below. Bureau Veritas Certification confirms that the project is implemented as planned and described in validated project design documents. Installed equipment being essential for generating emission reduction runs reliably and is calibrated appropriately. The monitoring system is in place and the project is ready to generate GHG emission reductions.

Bureau Veritas Certification can confirm that the GHG emission reduction is calculated without material misstatements. Our opinion relates to the project's GHG emissions and resulting GHG emissions reductions reported and related to the valid project baseline and monitoring, and its associated documents. Based on the information we have seen and evaluated we confirm the following statement:

Reporting period: From 01/01/2008 to 31/12/2008
Baseline emissions : 2148713,7 t CO2 equivalents.
Project emissions : 1852624,6 t CO2 equivalents.
Emission Reductions : 296089,1 t CO2 equivalents.

7 REFERENCES

Category 1 Documents:
Documents provided that relate directly to the GHG components of the project.

/1/ Project Design Document, version 1, dated 15 of July 2008

/2/ Monitoring Report version 01 , dated 10 of March 2009

/3/ Monitoring Report version 02 , dated 25 of March 2009

/4/ Verification Report, Bureau Veritas Certification Holding SAS No. UKRAINE-VER#/2008 version 01 dated 26 of December 2008

Category 2 Documents:
Background documents related to the design and/or methodologies employed in the design or other reference documents.

/5/

Documents checked during the verification onsite are presented in Annex C

Persons interviewed:

List of persons interviewed during the verification or persons that contributed with other information that are not included in the documents listed above.

/1/ Sigal Aleksandr – Director of the Institute of Engineering Ecology

/2/ Paderno Dmitriy – Vice -director of the Institute of Engineering Ecology

/3/ Grechko Tetyana – Senior engineer of the Institute of Engineering Ecology

/4/ Andreev Sergey Yurievich – Director ME " Kharkivski teplovi merezhi"

/5/ Repin Andrey Petrovich – Head of the Production and Technical Department at ME " Kharkivski teplovi merezhi", Manager of the JI Project

/6/ Dolgenko Andrey Vyacheslavovich – Manager of the supporting group of the JI Project in the Production and Technical Department at ME " Kharkivski teplovi merezhi"

/7/ Beloshenko Aleksandr Vladimirovich – Head of the Heating Region

/8/ Chaimovich Mihail Aleksandrovich – Lead Engineer of Oktyabriskiy District

/9/ Kitanin Viktor Oleksandrovuch - Head of the Municipal economy Department at the Executive Committee of Kharkiv City

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APPENDIX A: COMPANY JI PROJECT VERIFICATION PROTOCOL

Initial Verification Protocol Table 1

Objective	Reference	Comments	Conclusion (CARs/FARs)
1. Opening Session			
1.1. Introduction to audits	/6/	The intention and the target of the audit were illustrated to the participants of the audit. Participants at the audit were the following persons: Verification team: Mr. Ivan Sokolov Lead Auditor, Bureau Veritas Ukraine, Mrs. Nadiia Kaiiun, Auditor, Bureau Veritas Ukraine, Oleg Skoblyk, specialist, Bureau Veritas Ukraine, Kateryna Zinevych, specialist, Bureau Veritas Ukraine. Interviewed persons: ME “Kharkivski teplovi merezhi”: The general director of ME "Kharkivski teplovi merezhi", Mr. Sergiy Andreev, appointed the responsible person, Mr. Andriy Repin, for the implementation and management of the monitoring process at the ME "Kharkivski teplovi merezhi". Mr. Andriy Repin is responsible for supervising of data collection, measurements, calibration, data recording and storage. Dr. Vladimir Gomon, Managing Engineer of European Institute for safety, security, insurance and environmental techniques, is responsible for baseline and monitoring methodology development Institute of Engineering Ecology:	**OK**

Objective	Reference	Comments	Conclusion (CARs/FARs)
		Dr. Dmitri Paderno, vice director of Institute of Engineering Ecology, is responsible for baseline and monitoring methodology development. Ms. Tetiana Grechko, senior engineer of Institute of Engineering Ecology, is responsible for baseline and monitoring methodology development and data processing.	
1.2. Clarification of access to data archives, records, plans, drawings etc.	/6/	The verification team got open access to all required plans, data, records, drawings and to all relevant facilities.	**OK**
1.3. Contractors for equipment and installation works	/6/	Project has been implemented as defined in the PDD and the implementation is evidenced by statements of work completion.	**OK**
1.4. Actual status of installation works	/6/	Implementation of boiler houses rehabilitation and network rehabilitation is realized according to the project plan. In several cases replacement of network pipes with different (from planned before) diameters took place. Same changers also were made in the monitoring methodology developed for “District Heating” projects in Ukrainian conditions”. Those changes concerned Adjustment factors calculations and allow to calculate GHG emissions reduction more transparent. Explain more detail what “Improving of the network organization” means**.**	**CAR1**

Objective	Reference	Comments	Conclusion (CARs/FARs)
		Response Improvement of the heat networks system organization is provided by liquidation of Heat Distribution Stations (HDS) with replacing 4-pipe lines by 2-pipe ones with simultaneous installation of heat exchangers directly at the consumers (Individual Heating Point – IHP), or reconstruction of HDS with modern lower capacity heat exchangers installation (reduction of necessary power will be realizable due to switching of part of power to IHP). It is enable to liquidate 46 km of pipes with different diameters, to reduce heat losses and to reduce power consumption for power supply of circulation pumps. Technical characteristic of new heat exchangers (see fig. 1) are presented on the producer's website http://teploenergo.com.ua	
2. Open issues indicated in validation report			
2.1. Missing steps to final approval	/3/	Based on the validation report the verification team identified no missing steps. The project has been approved by NFP.	**OK**
3. Implementation of the project			
3.1. Physical components	/6/	Implementation of boiler houses rehabilitation and network rehabilitation are realized according to project plan. In several cases take place replacement of different (from planed before) diameters of network pipes. Implementation of CHP units at ME "Kharkivski teplovi merezhi" have not been finished yet. So follow the principle of conservatism the CO2 emissions reduction calculations by power production were not carried out.	**OK**

Objective	Reference	Comments	Conclusion (CARs/FARs)
		Installation of frequency controllers have not finished yet. Calculations of CO2 emissions reduction by power saving was not carried out.	
3.2. Project boundaries	/6/	Yes the project boundaries are as defined in the PDD.	**OK**
3.3. Monitoring and metering systems	/6/	The installations have the metering and measurement devices such as gas flow meters, electric power consumption meters to monitor parameters related to project. All equipments are of reputed make and included in the structured calibration plans where they are periodically calibrated. The procedures have been documented for the equipment operation. Explain operation principle of device for automatic control of natural gas consumption. *Response* ME "Kharkivski teplovi merezhi" uses correctors of gas flue meters “RADOMIR”. Flowing readings are taken from correctors of gas flue meters “RADOMIR” - readings of gas flue meter numerator;	**CAR 2**

Objective	Reference	Comments	Conclusion (CARs/FARs)
		- current readings of gas flue meter at the corrector; - difference of readings of gas flue meter and corrector; - average daily average overpressure of gas; - average daily temperature of gas; - digital value of factor condensability; - digital value of correction factor to standard conditions; - daily volume of gas (standard conditions); - accumulate volume of gas per month (standard conditions)	
3.4. Data uncertainty	/6/	All measuring equipment corresponds to the regulatory requirements on accuracy of meters and measurement deviations that is calculated and certified. This ensures the required by the technology level of uncertainty of the estimations.	**OK**
3.5. Calibration and quality assurance	/6/	All monitoring equipment is part of detailed calibration plan. The strict control is maintained over the calibration process. On the date of verification, Calibration records of the measuring and monitoring equipment has been verified at site. All the meters have been found to be calibrated regularly as per determined calibration plan for each site.	**OK**

Objective	Reference	Comments	Conclusion (CARs/FARs)
3.6. Data acquisition and data processing systems	/6/	Registration of Natural gas consumption at boiler houses of ME "Kharkivski teplovi merezhi" is carried out by the following scheme: 1. All boiler-houses are equipped with gas flow meters. 2. For automatic fuel control: gas flue commercial system, installed at gas distributing units of the boiler-houses, that consist of - gas flow meter and automatic corrector for temperature and pressure. Gas consumption registered automatically. Operators of all boiler-houses register the instrument readings in the paper journals “Journal of registration of boiler-house’s operation parameters” every day. 3. At the boiler-houses that are not equipped with gas volume correctors (at present about 10 % of the total number of boiler-houses), operators register parameters of gas: temperature and pressure in these journals every 2 hours. These parameters are used to bring gas consumption to normal conditions. 4. Every day operators transfer values of gas consumption to dispatcher of the regional branch of ME "Kharkivski teplovi merezhi" by phone. Monthly they transfer the paper report. 5. Regional branches transfer data to Techno-Economic Activities Department (TEA) of Production-Technical Service (PTS) of ME "Kharkivski teplovi merezhi" where they are storing and used for payments with gas suppliers.	**OK**

Objective	Reference	Comments	Conclusion (CARs/FARs)
		All measuring equipment and calibration is presented in Annex 3. of the Monitoring Report version 02.	
3.7. Reporting procedures	/6/	The Monitoring Plan defines the responsibilities to consolidate the data required for emission reduction calculations. Calculations are transparent and restricted to entering annually the production data into a predefined Excel spreadsheet.	**OK**
3.8. Documented instructions	/6/	Section B.3. Data processing and archiving (including software used) of the Monitoring Report version 2 provides with the necessary information relating the procedures for the monitoring, measurements and reporting. These were verified onsite and found satisfactory.	**OK**
3.9. Qualification and training	/6/	The overall authority of the project is personally supervised by Andriy Repin who is responsible for collection and compilation of all data related to this JI Project at ME "Kharkivski teplovi merezhi". The responsibilities and authorities are described for each individual in job descriptions as required statutorily.	**OK**

Objective	Reference	Comments	Conclusion (CARs/FARs)
3.10. Responsibilities	/6/	The overall authority of the project is personally supervised by Andriy Repin who is responsible for collection and compilation of all data related to this JI Project at ME “Kharkivski teplovi merezhi”. The responsibilities and authorities are described for each individual in job descriptions as required statutorily.	**OK**
3.11. Troubleshooting procedures	/6/	Procedure exists to react in the case incorrect data appear or equipment failure. There is a separate procedure laid down for measuring and recording energy related parameters.These procedures include the troubleshooting tips.	**OK**
4. Internal Data			
4.1. Type and sources of internal data	/6/	The internal parameters are obtained according to the monitoring plan: Monitoring report, Annex2 contains internal parameters that are monitored.	**OK**
4.2. Data collection	/6/	The responsibility for data collection is described in the monitoring plan. Registration of Natural gas consumption at boiler houses of ME "Kharkivski teplovi merezhi" is carried out by the following scheme: 1. All boiler-houses are equipped with gas flow meters. 2. For automatic fuel control: gas flue commercial system,	**OK**

Objective	Reference	Comments	Conclusion (CARs/FARs)
		installed at gas distributing units of the boiler-houses, that consist of - gas flow meter and automatic corrector for temperature and pressure. Gas consumption registered automatically. Operators of all boiler-houses register the instrument readings in the paper journals “Journal of registration of boiler-house’s operation parameters” every day. 3. At the boiler-houses that are not equipped with gas volume correctors (at present about 10 % of the total number of boiler-houses), operators register parameters of gas: temperature and pressure in these journals every 2 hours. These parameters are used to bring gas consumption to normal conditions. 4. Every day operators transfer values of gas consumption to dispatcher of the regional branch of ME "Kharkivski teplovi merezhi" by phone. Monthly they transfer the paper report. 5. Regional branches transfer data to Techno-Economic Activities Department (TEA) of Production-Technical Service (PTS) of ME "Kharkivski teplovi merezhi" where they are storing and used for payments with gas suppliers.	

Objective	Reference	Comments	Conclusion (CARs/FARs)
4.3. Quality assurance	/6/	Section B.3. Data processing and archiving (including software used) of the Monitoring Report version 2 provides with the necessary information relating the procedures for the monitoring, measurements and reporting. These were verified onsite and found satisfactory.	**OK**
4.4. Significance and reporting risks	/6/	As the records are maintained on daily basis and the consumption natural gas is a statutory records the chances of misstatement are hereby low.	**OK**
5. External Data			
5.1. Type and sources of external data	/6/	The external data used are following: •Emission factor of fuels – IPCC values are used. •Calorific Values of fuels – calculated values are used. The external parameters are obtained according to the monitoring plan: Monitoring report, Annex2 contains external parameters that are monitored.	**OK**
5.2. Access to external data	/6/	Origin of the external data is indicated in the monitoring report, Annex 2.	**OK**
5.3. Quality assurance	/6/	See chapter 5.1.	**OK**
5.4. Data uncertainty	/6/	See chapter 5.1.	**OK**

Objective	Reference	Comments	Conclusion (CARs/FARs)
5.5. Emergency procedures	/6/	See chapter 5.1.	**OK**
6. Environmental and Social Indicators			
6.1. Implementation of measures	/6/	Environmental and social indicators are not defined in the monitoring plan. Hence the question is not applicable. But the client takes action on a voluntary basis regarding environmental and social issues: The auditor team on site was informed on local stakeholders opinion. They expressed their appreciations for the project. As per them the project has brought improvements in heat supply system, which the project has brought in.	**OK**
6.2. Monitoring equipment	/6/	See chapter 6.1.	**OK**
6.3. Quality assurance procedures	/6/	See chapter 6.1.	**OK**
6.4. External data	/6/	See chapter 6.1.	**OK**
7. Management and Operational System			
7.1. Documentation	/6/	The company complies with all legal and statutory requirements of the Ukraine and the same were made available to the verification team. ME “Kharkivski teplovi merezhi” has all the necessary permissions and licenses, issued by the State Inspection on Labor Safety, that allow performing of the following activities:	**OK**

Objective	Reference	Comments	Conclusion (CARs/FARs)
		to operate, repair and install the steam and hot-water boilers, steam and hot-water pipelines; to perform building and installation works; to perform designing works; to conduct adjustment and alignment of fuel-using equipment.	
7.2. Qualification and training	/6/	The overall authority of the project is personally supervised by Andriy Repin who is responsible for collection and compilation of all data related to this JI Project at ME "Kharkivski teplovi merezhi". The responsibilities and authorities are described for each individual in job descriptions as required statutorily.	**OK**
7.3. Allocation of responsibilities	/6/	The responsibilities and authorities are described for each individual in job descriptions as required statutorily. Persons working at sites are aware of their responsibilities, and relative records are maintained.	**OK**
7.4. Emergency procedures	/6/	The emergency procedures with respect to operation controls are available in data control	**OK**
7.5. Data archiving	/6/	Data are archived in the physical and electronic forms and then stored electronically.	**OK**
7.6. Monitoring report	/6/	Calculations are laid down in the monitoring report.	**OK**
7.7. Internal audits and management review	/6/	In the Section B.1.3 and Section C of the Monitoring Report version 2 internal audits and control measures are performed.	**OK**

Objective	Reference	Comments	Conclusion (CARs/FARs)
		Measurement equipment calibration for ME “Kharkivski teplovi merezhi” was carried out by Kharkiv center of standardization and metrology. Performance review for the project is made by Production Technical department.	

Periodic Verification Checklist Protocol Table 2: Data Management System/Controls

Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
1. Defined organizational structure, responsibilities and competencies		

Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
1.1. Position and roles	Full	The general director of ME “Kharkivski teplovi merezhi”, Mr. Sergey Andreev , appointed a responsible person, Mr. Andriy Repin, for the implementation and management of the monitoring process at ME “Kharkivski teplovi merezhi”. Mr. Andriy Repin is responsible for supervising data collection, measurements, calibration, data recording and storage. Dr. Vladimir Gomon, Managing Engineer of European Institute for safety, security, insurance and environmental techniques, is responsible for baseline and monitoring methodology development. Dr. Dmitri Paderno, vice director of Institute of Engineering Ecology, is responsible for baseline and monitoring methodology development. Ms. Tetiana Grechko, senior engineer of Institute of Engineering Ecology, is responsible for baseline and monitoring methodology development and data processing.
1.2. Responsibilities	Full	Mr.Andriy Repin, Head of the Production and Technical Department is responsible for supervising data collection, measurements, calibration, data recording and storage at ME “Kharkivski teplovi merezhi”. Dr. Vladimir Gomon, Managing Engineer of European Institute for safety, security, insurance and environmental techniques, is responsible for baseline and monitoring methodology development Dr. Dmitri Paderno, vice director of Institute of Engineering Ecology, is responsible for baseline and monitoring methodology development. Ms. Tetiana Grechko, senior engineer of Institute of Engineering

Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
		Ecology, is responsible for baseline and monitoring methodology development and data processing.
1.3. Competencies needed	Full	The overall authority of the project is personally supervised by Andrey Repin who is responsible for collection and compilation of all data related to this JI Project at ME “Kharkivski teplovi merezhi” . The responsibilities and authorities are described for each individual in job descriptions as required statutorily.
2. Conformance with monitoring plan		
2.1. Reporting procedures		The monitoring plan is as per the registered PDD. The applauded version of PDD is publicly available at the site http://ji.unfccc.int/JI_Projects/DeterAndVerif/Verification/PDD/index.html where it was placed during determination process. The monitoring methodology developed for “District Heating” projects in

Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
		Ukrainian conditions" was used in monitoring process.
2.2. Necessary Changes	Full	Implementation of boiler houses rehabilitation and network rehabilitation is realized according to the project plan. Same changes also were made in the monitoring methodology developed for "District Heating" projects in Ukrainian conditions". Those changes concerned Adjustment factors calculations and allow to calculate GHG emissions reduction more transparent.
3. Application of GHG determination methods		
3.1. Methods used	Full	The reporting procedures reflect the monitoring plan content. The calculation of the emission reduction is correct.
3.2. Information/process flow	Full	The necessary procedures have been defined in internal procedures and additional internal documents relevant for the determination of the various parameters on regular basis. Registration of Natural gas consumption at boiler houses of ME "Kharkivski teplovi merezhi" is carried out by the following scheme: 1. All boiler-houses are equipped with gas flow meters.

Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
		2. For automatic fuel control: gas flue commercial system, installed at gas distributing units of the boiler-houses that consist of - gas flow meter and automatic corrector for temperature and pressure. Gas consumption registered automatically. Operators of all boiler-houses register the instrument readings in the paper journals “Journal of registration of boiler-house’s operation parameters” every day. 3. At the boiler-houses that are not equipped with gas volume correctors (at present about 10 % of the total number of boiler-houses), operators register parameters of gas: temperature and pressure in these journals every 2 hours. These parameters are used to bring gas consumption to normal conditions. 4. Every day operators transfer values of gas consumption to dispatcher of the regional branch of ME "Kharkivski teplovi merezhi" by phone. Monthly they transfer the paper report. 5. Regional branches transfer data to Techno-Economic Activities Department (TEA) of Production-Technical Service (PTS) of ME "Kharkivski teplovi merezhi" where they are storing and used for payments with gas suppliers.
3.3. Data transfer	Full	The complete data is stored electronically and also the part of Management information system which is controlled by accounts

Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
3.4. Data trails	Full	The necessary procedures have been defined in internal procedures and additional internal documents relevant for the determination of the all the parameters listed in the monitoring plan
4. Identification and maintenance of key process parameters		
4.1. Identification of key parameters	Full	The critical parameters for the determination of GHG emissions are the parameters listed in section D of the approved PDD
4.2. Calibration/maintenance	Full	The company maintains the elaborate calibration plan for each of the equipment. The audit team verified the status for all the equipment at the sites sampled for the audit and found them to be complying with the plan.
5. GHG Calculations		
5.1. Use of estimates and default data	Full	The carbon emission factor & Net calorific values is used as a predetermined default value which has been defined in the PDD and confirmed during validation of the project.

Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
5.2. Guidance on checks and reviews	Full	Internal audits and control measures are performed. Measurement equipment calibration for ME “Kharkivski teplovi merezhi” was carried out by Kharkiv center of standardization and metrology.
5.3. Internal validation and verification	Full	Monitoring procedure for JI Project includes the responsibility and frequency for carrying out internal audits. The audit team did verify all the parameters listed in monitoring report
5.4. Data protection measures		The necessary procedures relating to Information technology are in place to provide necessary data security, and also prevent the unauthorized use of the same.
5.5. IT systems	Partial	The IT system does not exist at the moment at ME “Kharkivski teplovi merezhi”, nevertheless the paper sheme of natural gas consumption exist. It was introduced to the verifiers during on -site visit and found satisfactory. For PP’s such system is more convenient and safe.

Periodic Verification Protocol Table 3: GHG calculation procedures and management control testing

Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
Potential reporting risks based on an	Regarding the potential reporting risks	The issue remaining is the way the data

Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
assessment of the emission estimation procedures can be expected in the following fields of action: ➢ the calculation methods, ➢ raw data collection and sources of supporting documentation, ➢ reports/databases/information systems from which data is obtained. Key source data applicable to the project assessed are hereby: ➢ metering records (gas and power consumption per heat generated), ➢ process monitors (heat generation), ➢ operational logs (metering records), ➢ laboratory/analytical data (for energy content of fuels), ➢ accounting records, Appropriate calibration and maintenance of equipment resulting in high accuracy of data supplied should be in place. It is hereby needed to focus on those risks that impact the accuracy,	identified in the left column the following mitigation measures have been observed during the document review and the on site mission: Key source data for this parameter are: • meter reading. • Invoices and record for Fuels (and coal) for consumption and purchase. The metering equipments are installed appropriately in the enclosure panels and same are of reputed make. Calculation methods: The reporting procedures reflect the monitoring plan content and the calculation of the emission reduction is correct and also additionally deducting the project emissions caused by fossil fuel.	obtained is used to calculate the emission reduction in a conservative manner according to the approach prescribed in the PDD as well as the way data obtained is used to calculate the emissions reductions/

Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
completeness and consistency of the reported data. Risks are weakness in the GHG calculation systems and may include: ➢ manual transfer of data/manual calculations, ➢ position of the metering equipment, ➢ unclear origins of data, ➢ accuracy due to technological limitations, ➢ lack of appropriate data protection measures (for example, protected calculation cells in spreadsheets and/or password restrictions).		

Periodic Verification Protocol Table 4: Detailed audit testing of residual risk areas and random testing

Areas of residual risks	Additional verification testing performed	Conclusions and Areas Requiring Improvement (including Forward Action Requests)
The issue remaining is the way the data obtained is used to	There has been a complete check of data transferred from daily consumption and	Having investigated the residual risks, the audit team comes to the following conclusion: Immediate action is not needed with respect to the current emission reduction calculation. Those corrections have been considered during the verification

Areas of residual risks	Additional verification testing performed	Conclusions and Areas Requiring Improvement (including Forward Action Requests)
calculate the emission reduction in a conservative manner according to the approach prescribed in the PDD.	generation readings to the calculation tool. There was no error in such transfer. The correct installation of the metering equipment can be confirmed.	process, so no residual risk is open.

Verification Protocol Table 5: Resolution of Corrective Action and Clarification Requests

Report clarifications and corrective action requests	Ref. to checklist question in tables 2/3	Summary of project owner response	Verification conclusion
CAR1. Explain more detail what "Improving of the network organization" means.	1.4	Improvement of the heat networks system organization is provided by liquidation of Heat Distribution Stations (HDS) with replacing 4-pipe lines by 2-pipe ones with simultaneous installation of heat exchangers directly at the consumers (Individual Heating Point – IHP), or reconstruction of HDS with modern lower	

Report clarifications and corrective action requests	Ref. to checklist question in tables 2/3	Summary of project owner response	Verification conclusion
		capacity heat exchangers installation (reduction of necessary power will be realizable due to switching of part of power to IHP). It is enable to liquidate 46 km of pipes with different diameters, to reduce heat losses and to reduce power consumption for power supply of circulation pumps. Technical characteristic of new heat exchangers (see fig. 1) are presented on the producer's website http://teploenergo.com.ua	
CAR 2. Explain operation principle of device for automatic control of natural gas consumption.		ME "Kharkivski teplovi merezhi" uses correctors of gas flue meters "RADOMIR". Flowing readings are taken from correctors of gas flue meters "RADOMIR" - readings of gas flue meter numerator; - current readings of gas flue meter at the corrector; - difference of readings of gas flue meter and corrector; - average daily average overpressure of gas; - average daily temperature of gas; - digital value of factor condensability;	

Report clarifications and corrective action requests	Ref. to checklist question in tables 2/3	Summary of project owner response	Verification conclusion
		- digital value of correction factor to standard conditions; - daily volume of gas (standard conditions); - accumulate volume of gas per month (standard conditions)	

APPENDIX B: VERIFICATION TEAM

The verification team consists of the following personnel:

Flavio Gomes, M.Sci. (civil engineering)

Team Leader

Bureau Veritas Certification, Climate Change Verifier
Flavio Gomes is a Chemical and Safety Engineer graduated from «UNICAMP – Universidade Estadual de Campinas», with a MSc title in Civil Engineer (Sanitation). He spent four years at RIPASA Pulp and Paper as Environmental Process Engineer. He is, since 2006 the Global Manager for Climate Change. Previously and since 1997, he was senior consultant for Bureau Veritas Consulting in fields of Environment, Health, Safety, Social Accountability and Sustainability audit and management systems. He also acted as Clean Development Mechanism verifier, and Social/Environmental Report auditor, in the name of Bureau Veritas Certification. Flavio is pursuing his PhD on Energy Management at the Imperial College – London.

Ivan G. Sokolov, Dr. Sci. (biology, microbiology)
Team member

Bureau Veritas Ukraine HSE Department manager.

He has over 25 years of experience in Research Institute in the field of biochemistry, biotechnology, and microbiology. He is a Lead auditor of Bureau Veritas Certification for Environment Management System (IRCA registered), Quality Management System (IRCA registered), Occupational Health and Safety Management System, and Food Safety Management System. He performed over 130 audits since 1999. Also he is Lead Tutor of the IRCA registered ISO 14000 EMS Lead Auditor Training Course, and Lead Tutor of the IRCA registered ISO 9000 QMS Lead Auditor Training Course. He has undergone intensive training on Clean Development Mechanism /Joint Implementation and he is involved in the validation of 6 JI projects.

Nadiya Kaiiun, M. Sci. (environmental science)
Team member

Bureau Veritas Ukraine HSE Department project manager.

She has graduated from National University of Kyiv-Mohyla Academy with the Master Degree in Environmental Science. She is a Lead auditor of Bureau Veritas Certification for Environment Management System (IRCA registered). She performed over 15 audits since 2008. She has undergone intensive training on Clean Development Mechanism /Joint Implementation and she is involved in the validation of 6 JI projects.

Oleg Skoblyk, Specialist (Energy Management)
Team member

Bureau Veritas Ukraine HSE Department project manager.

He has graduated from National Technical University of Ukraine 'Kyiv Polytechnic University" with specialty Energy Management. He is a Lead auditor of Bureau Veritas Certification for Environment Management System (IRCA registered). He performed over 10 audits since 2008. He has undergone intensive training on Clean Development Mechanism /Joint Implementation and he is involved in the validation of 3 JI projects.

Kateryna Zinevych, M. Sci. (environmental science)
Team member

Bureau Veritas Ukraine HSE Department project manager.

She has graduated from National University of Kyiv-Mohyla Academy with the Master Degree in Environmental Science. She is a Lead auditor of Bureau Veritas Certification for Environment Management System (IRCA registered). She performed 6 audits since March of 2009. She has undergone intensive training on Clean Development Mechanism /Joint Implementation and she is involved in the validation of 3 JI projects.

Ashok Mammen - PhD (Oils & Lubricants)

Bureau Veritas Certification Internal reviewer
Over 20 years of experience in chemical and petrochemical field. Dr. Mammen is a lead auditor for environment, safety and quality management systems and
a lead verifier for GHG projects. He has been involved in the validation

and verification processes of more than 60 CDM/JI and other GHG projects.

APPENDIX C: DOCUMENTS CHECKED DURING VERIFICATION

Volodarskogo str., 63a

1. Photo, the boiler house at Volodarskogo str., 2/4
2. The act of putting into operation gas boiler ALTAIR RTNE48. Dated 12.2008.
3. The act of putting into operation gas boiler ALTAIR RTNE48. Dated 12.2008.
4. Act of faulty №537. Gas boilers reconstruction. Dated 11.2008.
5. Photo, temperature chart
6. Photo, gas volume corrector КПЛГ 2.01Р#01301 at Volodarskogo str., 2/4
7. Photo, the gas meter GMS-G16-32-0,6-У31-НЧ at Volodarskogo str., 2/4. Serial number №053109.
8. Photo, round journal at Volodarskogo str., 2/4
9. Photo, shift journal at Volodarskogo str., 2/4
10. Photo, parameters journal at Volodarskogo str., 2/4
11. Photo, gas metering journal at Volodarskogo str., 2/4
12. Photo, certificate of acceptance of gas volume KPLG-2.01 at Volodarskogo str., 2/4. Serial number №01301. Dated 06.03.2007.
13. Photo, water heating boiler "КОЛВИ ТЕРМОНА» КТН 1.100 №350 dating 09/2008
14. Photo, instruction of measuring parameters from the meter SUPERCAL.531

Gordienkivskoy str., 42

15. Photo, passport of gas volume corrector КПЛГ-2.01Р№01114. Dated 22.01.07.
16. Photo, boiler house
17. Photo, heating boiler "Колви-100"№1
18. Photo, heating boiler "Колви-100"№4
19. Photo, heating boiler "Колви-100"№3
20. Photo, heating boiler "Колви-100"№2
21. Photo, alarm mode МДУ-02 and control and alarm units БКС-05, БКС-04
22. Photo, gas volume corrector
23. Photo, temperature chart
24. Photo, shift journal
25. Photo, labour safety control journal
26. Photo, boiler-house work shifts journal
27. Photo, boiler-house plan

Elektrovozna str.

28. Act of putting in operation expenditures on boiler КОЛВИ – 3000 М assembling. Dated 11.2008.
29. Act of putting in operation expenditures on boiler КОЛВИ – 3000 М assembling. Dated 11.2008.
30. Act of putting in operation expenditures on boiler КОЛВИ – 3000 М assembling. Dated 11.2008.
31. Act №153 of acceptance performed works. Dated 03.2006.

Kvitkinska str., 25

32. Act №411 for established equipment at 12.2007
33. Act №1 of acceptance performed works at 10.2007.
34. Act №5 of acceptance performed works at 12.2007.

35. Act №350 of acceptance performed works at 11.2007.
36. Calculation №2. Manufacturing expenditure №350.
37. Act of faulty №350. Steel pick dismantling.
38. Photo, passport of gas volume corrector КПЛГ-2.01Р№02889. Dated 01.09.08
39. Photo, gas pipeline scheme
40. Photo, control and alarm unit БКС02
41. Photo, boiler #3
42. Photo, water heating boiler КОЛВИ500. Serial number 1239.583
43. Photo, water heating boiler КОЛВИ500. Serial number 1229.572
44. Photo, water heating boiler КОЛВИ500. Serial number 02190. tested 28.10.08
45. Photo, gas meter GMS-G160-80-1,0-У2-НЧ
46. Photo, three-phase meter СТЭА8
47. Photo, gas metering journal starting 01.10.06
48. Photo, boiler working shifts journal

Dostoevskogo str., 22

49. Act №118 of acceptance-transfer at 02.2008.
50. Act №200 of acceptance performed works. Dated 08.2008.
51. Act of putting in operation pump Х50-32-125 with power engine from 08.2008.
52. Act of faulty. Salt pump Х8-18ДХВО.
53. Act №222 of acceptance performed works. Dated 08.2008.
54. Calculation №2. Manufacturing expenditure №222.
55. Ministerial duty note. Dated 03.09.2008.
56. Act of faulty№200. Salt pump Х8-18ДХВО dismantling.
57. Calculation №2. Manufacturing expenditure №200.
58. Photo, the boiler КВГ 7,56. Serial number №5979.
59. Photo, boiler working journal.
60. Photo, operational journal.
61. Photo, the list of first counting heat in the hot water.
62. Photo, regime card of the boiler №1 КВГ-6,5
63. Photo, gas meter G160 ЛГК-80-1/20-1,6-1-Ех.
64. Photo, gas meter G160 ЛГК-150-650-0,4-01-Ех.
65. Photo, frequency converter СТ2 075
66. Photo, power meters #688647, #686499,
67. Photo, Certificate of checking working measuring equipment: gas flow meter ЛГ-К-80 G160. Dated 04.10.2007.
68. Photo, passport of gas flow meter GMS-G 40-40-0,1-92-Н4 #115005. Dated 27.11.07
69. Photo, passport of gas flow meter GMS-G 40-40-0,1-92-Н4 #049374. Dated 04.05.06.
70. Photo, Certificate of checking working measuring equipment: gas flow meter ЛГ-К-150-650#406. Dated 14.10.2008.
71. Photo, Certificate of checking working measuring equipment: gas flow meter ЛГ-К-80 G160#8502. Dated 04.10.2007.
72. Photo, Certificate of checking working measuring equipment: gas flow meter РГ-К-40#10154. Dated 26.09.2008.
73. Photo, passport of gas volume corrector КПЛГ-2.01Р№00395. Dated 24.09.04.
74. Photo, passport of hot and cold water meters MW (MWN)Ду50-250мм
75. Photo, frequency transformer «СТРУМ» model СТ2-075

Biologicheskaya str., 1

76. Act of acceptance-transfer at 07.2008.
77. Act of putting in operation boiler АОГВ-50 assembling from 07.2008.
78. Act №118 of acceptance performed works. Dated 05.2008.
79. Calculation №2. Manufacturing expenditure №118.
80. Photo, passport of gas volume corrector КПЛГ-2.01Р№01117. Dated 22.01.07.
81. Photo, gas pipeline scheme
82. Photo, heater АОГВ-50Э ТУУ21189935.001-94
83. Photo, gas volume corrector КПЛГ 2.01Р
84. Photo, gas metering journal
85. Photo, operating journal
86. Photo, boiler-house working shifts journal
87. Photo, water heating temporary regime card
88. Photo, heat mechanics unit БТ01#030
89. Photo, boiler house
90. Photo, alarm unit
91. Photo, water heating boiler temporary regime card #1 Osprey 220-CF
92. Photo, water heating boiler temporary regime card #3 Osprey 220-CF

Yaroslavskaya str., 17

93. Act of putting in operation membrane box for heating system REFLEX from 12.2008.
94. Act of putting in operation pump Grundfos type UNILIFT-AP from 12.2008.
95. Act of putting in operation boiler “Колба КТН 1-100СР” 96 kVt from 12.2008.

Ilyicha str., 118

96. Act №271 of putting in operation heating main from boiler house at Ilyicha str.118 to ТК1. Dated 30.03.07
97. Act №72 of acceptance performed works for 03.2007.
98. Calculation №2. Manufacturing expenditure №72.
99. Act of faulty №72. Heating main Ф219ППУ-373б58 from boiler-house Ilyicha str.118.
100. Photo, water heating boiler temporary regime card #1 ШБА7
101. Photo, water heating boiler temporary regime card #2 ДКВ6,6-13
102. Photo, water heating boiler temporary regime card #1 ДКВ6,5-13
103. Photo, gas meter ВРСГ-1 №2858
104. Photo, passport of the boiler house #1
105. Photo, daily parameters journal
106. Photo, shift journal ШБА-7
107. Photo log-book
108. Photo, boiler-house working shift journal
109. Photo, shift journal ДКВ
110. Photo, heat network round journal
111. Photo, malfunction registration journal
112. Photo, instruction journal
113. Photo, consumer complaints’ journal
114. Photo, gas pipeline scheme
115. Photo, gas registration journal starting 18.07.03
116. Photo, power registration journal starting 18.07.03

Postysheva str., 20

117. Act №2-14 of acceptance performed works for 02.2008.
118. Calculation №2. Manufacturing expenditure №2-14.
119. Act of faulty №2-14. Pipelines dismantling at the Postysheva str.
120. Inventory list of the main reconstruction equipment.
121. Photo, boiler house
122. Photo, energy meter СА4У И672.Serial number 0802190.
123. Photo, pipelines
124. Photo, boiler-house #1. IN 0100077
125. Photo, water heating boiler temporary regime card #1 ШБА7
126. Photo, boiler#2. Registration number 6650

Kibalchicha str., 18

127. Photo, passport of gas volume corrector КПЛГ-1.01Р№00060. Dated 22.04.02.
128. Photo, passport of gas meter ЛГКЕх-1.01Р№6226. Dated 22.04.02.
129. Certificate of checking working measuring equipment: gas flow meter ЛГ-К-150-400-16-0,1 #6226. Dated 22.05.2007.
130. Photo, protocol of calibration working measuring equipment: gas flow meter ЛГ-К-150-400-16-0,1 #6226. Dated 21.09.2000.
131. Certificate of acceptance of working measuring equipment: gas flow meter GMS-G 16-32-06-У31-Н4 #053109. Dated 25.05.2007.

Other documents

132. The contract №400 of a natural gas supply. Dated 29.01.2003
133. The contract №400/611137 of services rendering of natural gas transporting. Dated 01.10.2005.
134. The contract №26/220089 of supply of meteorological information. Dated 27.01.2009
135. The contract №702 of services rendering of power energy utilization. Dated 13.11.2002.
136. Certificate of checking working measuring equipment: gas flow meter РГ-К G25. Dated 02.10.2008.
137. Certificate of checking working measuring equipment: gas flow meter ЛГ-К-150-650. Dated 26.07.2007.
138. Certificate of acceptance working measuring equipment: gas volume corrector КПЛГ-1.02 Р №02157. Dated 28.11.2007.
139. Certificate of acceptance working measuring equipment: gas flow meter GMS TY Y 33.2-31519293-001-2001. Dated 12.12.2007.
140. The report of gas charges of Leninskiy branch boiler-houses of KP «KHTS» at 10.2008.
141. The report of gas charges of Zhovtneviy branch boiler-houses of KP «KHTS» at 01.2008.
142. The report of gas charges of Chervonozavodskogo branch boiler-houses of KP «KHTS» at 01.2008.
143. The report of gas charges of Ordzhonikidzivskiy branch boiler-houses of KP «KHTS» at 01.2008.
144. The report of gas charges of of Leninskiy branch boiler-houses of KP «KHTS» at 12.2008.
145. The report of gas charges of of Chervonozavodskogo branch boiler-houses of KP «KHTS» at 12.2008.

146. The report of gas charges of of Ordzhonikidzivskiy branch boiler-houses of KP «KHTS» at 12.2008.
147. The contract for heat and hot water supply services. Dated 01.03.2009.
148. Decree of ME “Kharkivski Teplovi Meregi” №40. Dated 31.12.2008.
149. Decree of ME “Kharkivski Teplovi Meregi” №251. Dated 06.05.2008.
150. Photo, Heating supply scheme of Kharkiv city.
151. Photo, information about boiler-houses of ME “Kharkivski Teplovi Meregi”
152. SNiP 2-3-79 (1998)
153. State Buildings Norms (B.2.6-31:2006)
154. KTM 204 Ukraine 244-941