MONITORING REPORT OF JI

PROJECT ANNUAL REPORT

No.04

Version 02

23 September 2011

Development and upgrade of district water supply and disposal system in Zaporizhzhia city

CONTENTS

ANNEXES

[1] Annex 2 provided on electronic media

[2] Annex 3 provided on electronic media

SECTION A. General project activities and monitoring information

A.1. Name of the project:

'Development and upgrade of district water supply and disposal system in Zaporizhzhia city .'

A.2. Information on project approval:

The project received approval from the Ukraine (the country, where the project is implemented) in September 2011, (Letter of Approval № 2722/23/7, issued by the State Environmental Investment Agency of Ukraine dated 23/09/2011).

A.3. Brief description of the project:

Main goal of the project is reduction of electric energy consumption via upgrade of the centralized water supply and drainage system of the Zaporizhzhia city, to include revamp and modernization of pumping units, and also reconstruction and replacement of water distributing networks and water disposal networks, as well as installation of frequency regulators, new meters, and water pumping process optimization. Reduced electric energy consumption will result in greenhouse gases (tCO2 and N2O) emission decrease. The project is aimed at facilitating sustainable development of the Zaporizhzhia city through implementation of energy saving technologies.

MU 'Vodokanal' development background. Zaporizhzhia water supply network is among the oldest companies of the city, having a great historical past and traditions that span many years. The MU 'Vodokanal' was established as a legal entity in 1993 following Decree No.1375 p dated 03.09.1993 of the executive committee of the Zaporizhzhia Local Council of People's Deputies.

The first centralized water supply system in Zaporizhzhia (Oleksandrivsk at that time) was commissioned in June 1894. Water pipelines on the right and left banks of the Dnipro river were integrated with the existing in 1928.

The first stage pumping station (Dnipro Water Supply Plant-1 (DWSP-1)) were commissioned in 1937.

In 1970, the Dnipro Water Supply Plant (DWSP-2) was commissioned on the right bank of the Dnipro river.

Sewage system has been under construction since 1933. Central treatment facilities (CTF-1) located on the left bank of the Dnipro river were commissioned in 1957, right bank central treatment facilities (CTF-2) - in 1976.

The Zaporizhzhia Municipal Utility 'Vodokanal' currently supplies potable water to public, entities and organizations of the central city of the region and three adjacent rural districts: Zaporizhzhia, Novomykolaivsk and Vilniansk.

Modern Zaporizhzhia water supply system is comprised of two water supply plants for potable water handling, 3 water intakes, 2522.5 km of water pipelines and 27 pumping stations. The two water supply plants DWSP-1 and DWSP-2 ensure daily purification and supply to consumers of up to 400 thousand meters of potable water.

The centralized sewage system is split. It concurrently receives domestic sewage waters from residential districts, public institutions, organizations, and (partially) - waste waters from utility and industrial enterprises of the city. The city sewage system presents a complex of sophisticated engineering facilities, among which there are 46 pumping stations and two plants of complete biological treatment of waste waters that daily process up to 200 thousand cubic meters of sewage. Overall length of pipelines and conduits is 923.97 km, pipe diameters is from 150 mm up to 2 000 mm.

The MU 'Vodokanal' is provided with all types of energy resources, transport and machinery, well-developed production infrastructure, and also has custody of skilled personnel, maintains fruitful contacts with research institutions. Judging by its performance indicators the Zaporizhzhia MU 'Vodokanal' ranges among major water suppliers of Ukraine.. Average number of MU 'Vodokanal' staff is 3433.

In January 2004, MU 'Vodokanal' management made the decision on the need in joint implementation project on greenhouse gases emissions reduction to be carried out at the enterprise. In January 2004, a Task Force was established to implement measures aimed at ensuring development and improvement of the centralized water supply and drainage system in the Zaporizhzhia city. During 2004, initial reconstruction measures were completed under the subject project.

a) Situation before commencement of the project

Prior to implementation of the project, the situation was characterized by inadequate technical condition of water supply and drainage systems in Zaporizhzhia, continuous wear of equipment, outdated process schemes resulting in increase of water loss and ineffective consumption of electricity in the course of water transportation.

In the absence of the Joint Implementation (JI) Project amounts of water loss in water supply and drainage systems of the MU 'Vodokanal' have been constantly growing, as well as consumed electric energy for transport of water amount unit (due to depreciation of equipment).

b) Baseline scenario

The subject baseline scenario is "business-as-usual" that provides for minimal repair against the background of total degradation of the water supply and water disposal system.

There are no barriers for implementation of this Baseline scenario (there are no investment barriers, since this scenario does not require involvement of additional investments; there are no technological barriers, since this equipment is being operated by skilled personnel and there is no need in additional retraining). This scenario reflects Ukrainian customary practice.

c) Project scenario

The project anticipates upgrade of 14 pieces of pumping equipment, installation of about 90 new pumping units, replacement of 11 km of water supply and water disposal pipelines, installation of the new group of meters – 114, installation of 18 frequency regulators and other energy saving measures.

Upon project completion annual savings will involve approximately 87.9K MW*hour of electrical power. Owing to decrease in electrical power consumption to feed pumping stations from the Ukrainian electric network, amount of fossil fuel fired in order to generate electrical power for the network will drop, which will result in reduced greenhouse gases emission.

The project anticipates greenhouse gases (GHG) emission to reduce due to the following:

- Pumping equipment upgrade;
- Replacement of energy-intensive pumps by new ones of higher energy-efficiency;
- Optimization of water pumping process;
- Replacement of water supply and water disposal networks;
- Installation of the new meters group;
- Installation of frequency regulators.

Estimated design annual diminutions of greenhouse gases emissions, namely: CO_2 will make up 101.1K tons a year upon project completion as against the "business-as-usual" case or baseline scenario.

The project may facilitate sustainable development of the MU 'Vodokanal' with regard to the following aspects:

- decrease in energy materials consumption of the entity;
- improved operation of water supply and water disposal system;
- high health and safety indexes;
- global environmental enhancement (response to global climate change via reduced carbon dioxide emission);
- resolving the problem of continuous water supply to consumers.

The above-stated will occur upon project implementation, when the water supply and drainage operations become more effective.
Analysis of project activities conformity has demonstrated absence of similar projects in Ukraine.

According to collected data the following value of GHG emission reduction was achieved during the monitoring period 2010 year**:**

Table 1. GHG emissions reduction during the monitoring period.

2010	Baseline emissions, tCO_2e	Project emissions, tCO_2e	Emissions reduction, tCO_2e
Emissions, tCO_2e	132865	37878	94987

A.4. Monitoring period:

- Monitoring period start date: 01/01/2010.
- Monitoring period completion date: 31/12/2010.

A.5. Methodology applied during the project:

A.5.1. Baseline methodology:

Project activities are aimed at decreasing GHG emission through the state electrical network as a result of modernization of water supply system in Zaporizhzhia, replacement of old pumping units by new, replacement of water distribution networks and introduction of new technologies of water supply.

The proposed project uses specific approach for joint implementation projects relying on baseline methodology of Clean Development Mechanism approved by the Executive Committee:
AM0020 "Baseline methodology for water pumping efficiency improvements"[3], Version 02, Valid from 02 November 2007.
Calculation of baseline GHG emissions is performed for each year of project implementation, because baseline emission depends on the amount of transferred water (pumped waste waters) by water supply and water disposal networks during the reporting period.

Since installation of new and reconstruction of old equipment under the project began at the end of 2004, from the conservative standpoint, the reductions due to this commissioning under the project are not counted.
Ukraine has an integrated power supply network. Carbon Emission Factor (EF) is used to analyze the monitoring period of 2010 year. Carbon Dioxide Emission Factor (EF) for 2010 was taken from regulation of Ukrainian legislation, in particular Order of the National Agency of Ecological Investments of Ukraine 'On approval of indexes for carbon dioxide specific emissions dated 2010'. Furthermore, the deterministic Project Design Documentation (hereinafter – 'PDD') also uses the mentioned factor.

[3] http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_K96TMFSTMHPPDMHSR8A5R3SJHLG32F

If Carbon Dioxide Emission Factors that are far more acceptable for the project are available, the baseline shall be recalculated for any reporting period according to the monitoring plan.

A.5.2. Monitoring methodology:

Verification of emission reduction units and baseline scenario

Monitoring Plan for this project was developed with a specific approach relying on AM0020 methodology (version 02) dated 02 November 2007.

Project completion indicator

The most objective and cumulative factor giving a clear picture of whether the emissions reduction has actually occurred, is electric energy saving. It may be defined as a difference between basic electric energy consumption and electric energy consumption after project implementation. If electric energy demand of pumps is at the design level, then any other indicators, such as new pumps operating efficiency, and water loss along water supply networks, are appropriate.

Verification of project completion indicators

The MU 'Vodokanal' collects and keeps data on electric energy and used water. Information about consumed electric energy and process water is attached to Monitoring Report on electronic media.

Data and parameters that are not monitored over the entire crediting period, but specified only once, but are available at the stage of PDD development, include the total amount of water supplied during base year, m^3 (M^3_{wb}), total amount of sewage pumped during base year, $м^3$ (M^3_{vb}), overall electric energy necessary for water transport during the year of baseline scenario, kW*hour (kWh_{wb}), overall electric energy necessary to pump sewage during the year of baseline, kW*hour (kWh_{vb}), carbon dioxide emission factor for Ukraine during 2010 as per regulation from the Ukrainian legislation, in particular Order of the National Agency of Ecological Investments of Ukraine 'On approval of indexes for carbon dioxide specific emissions dated 2010'.

Data and parameters, which are not monitored over the entire crediting period, but determined only once, which are not available at the stage of PDD development, are absent.

Data and parameters monitored within the entire crediting period: total amount of water supplied through the water supply system during the project year, m^3 ($M^3_{i\,wr}$), amount of sewage pumped through the water disposal system during the project year, m^3 (M^3_{ivr}), electric energy, kW*hour, required for water transport water within the water supply system during the year of project scenario, (kWh_{wri}), electric energy, kW*hour, required to pump sewage within the water disposal system during the year of project scenario, ($kWh_{vr\,i}$).

A.6. Progress status including project milestones:

Considering the fact that new equipment commissioning and upgrade of the old equipment that commenced under the project at the end of 2004, assumed as the base year, from the standpoint of conservatism, achieved as a result of this commissioning under the project are not counted. 1 January 2005 the date of generation of the first emission reduction units was assumed as the crediting period start date. The end date of the crediting period is 31 December 2030. Therefore, crediting period duration will make up 26 years/312 months.

Status of project implementation during the reporting year of 2010, including its milestones, is given in Table 2.

Table 2. Project progress status.

No.	Measures	Number of works completed	Date of measures commencement under the project	Completion end date of measures completion under the project
1	Pumping equipment upgrade	-	10/2004	12/2006
2	Pumping equipment replacement	-	10/2004	06/2011
3	Optimization of water pumping processes	1	05/2006	12/2012
4	Replacement of water supply and water disposal networks	0,469 км	04/2005	06/2010
5	Installation of new meters group	20	05/2004	05/2011
6	Introduction of frequency regulators	-	10/2004	12/2009

Measures under the project are mainly implemented according to the Project Plan.
According to the implementation schedule provided in PDD, development of design documentation for upgrade, reconstruction and replacement of pumping equipment, and frequency regulators installation started in October 2004. Physical activities on upgrade, reconstruction and replacement of pumping equipment and frequency regulators installation started on October 2004.

For details regarding measures completed at MU 'Vodokanal' facilities, please refer to Annex 2 provided on electronic media.

Apart of the mentioned above, over the reporting year of 2010, a number of other energy saving measures took place at the MU 'Vodokanal', they are defined as systematic, as they are introduced annually regardless of measures envisaged by the project. Other energy saving measures are listed in Tables 3 and 4.

Table 3. Other energy saving measures at MU 'Vodokanal'.

No.	Measures	Measures commencement date	Completion end date
1	Efficient replacement of gravel-sand filters	10/2004	12/2012
2	Optimized automation for control systems to reduce energy consumption (pumps cut-off)	10/2004	12/2012
3	Efficient control of "phi" cosine	10/2004	12/2012
4	Continuous reduction of illumination electrical energy demand	10/2004	12/2012
5	Streamlined loopback monitoring	10/2004	12/2012
6	Efficient utilization of pumping equipment motors (stop electrical motors idling)	10/2004	12/2012

7	Filters replacement within the water disposal system	10/2004	12/2012
8	Utilization of vertical pumps having higher efficiency factor for smooth-start system	10/2004	12/2012
9	Introduction of water supply schedules (agreed with consumers demanding considerable amounts of water) in order to reduce electrical energy consumption and maintain pressure in pipelines.	10/2004	12/2012

Table 4. Scheduled preventive measures at MU 'Vodokanal'.

No.	Measures	Measures commencement date	Completion end date
1	Elimination of accidents along pipelines	01/2010	12/2010
2	Reduction of water losses during accidents along pipelines	01/2010	12/2010

A.7. Deviations or changes in registered PDD:

No deviations from the registered PDD were observed over the reporting period.

A.8. Deviations or changes in registered Monitoring Plan:

No deviations from the registered Monitoring Plan were observed over the reporting period.

A.9. Individuals responsible for Monitoring Report development and submission:

JSC “OBLTEPLOCOMUNENERGO” -Legal body
Chernigiv, Ukraine
Yaroslav Y.Bechko
Economist of VPZGD
Tel./ Fax (+380462) 676-406
e-mail: obltеplokomunenergo@ukr.net

“Vodokanal” MU -Legal body
Zaporizhzhia, Ukraine
Volodymyr P. Tkachuk
MU 'Vodokanal' Engineering Department Deputy Head
Tel./ Fax +38 (061)2222401

SECTION B. Key monitoring activities

Control and monitoring of the system lies in measuring electrical energy consumption by water supply and sewage pumping stations , recording of water supplied to the network and amount of sewage pumped by MU 'Vodokanal'. Other parameters shall be obtained by means of calculations or from statistical data.

Measures to control electrical energy consumed by the MU 'Vodokanal':

- Current control of electric energy meters operation is conducted during billing period (billing month is determined based on conditions of contract for electric energy supply);
- On the day stipulated by the contract (as a rule it is at 00 hours 00 minutes on the 1st day of the month following the billing month) area supervisor or his authorized representative shall take the readings of electric energy meters (electric energy meters are the devices that passed state certification, accepted for operation and jointly sealed by the representatives of power supplying organization and MU 'Vodokanal' subject to execution of act of sealing). Obtained information shall be delivered by area supervisor to the Chief Engineer Department;
- Act on electric energy consumption shall be executed according to the readings of electric energy meters obtained from shops.

Supplied water flow measurement at MU 'Vodokanal':

- Water supplied by MU 'Vodokanal' water facilities shall be measured by means of water meters installed at pumping stations;
- Readings shall be taken every hour and documented in logs of established form PID-11;
- Data on amount of water supplied by pumping stations over a previous day shall be submitted to control department of each production unit on a daily basis at 00:00 o'clock;
- Individuals responsible for statistical reporting following forms No.1- water supply, No.1-sewage shall prepare statements based on dispatching records on produced water before 10th day of each month, and submit them to proper departments of MU 'Vodokanal' administration;
- Reports No.1- water supply, No.1-sewage shall be annually delivered to the Statistics Administration.

Standard electric and water meters are shown on Figures 1-5.

Figure 1. Electric meter SL7000

Figure 2. Electric meter A1140RAL-BW-4T

Figure 3. Electric meter СТК3-10Q2H6Mt

Figure 4. Heat and water meter (СІЧ-Узв)

Figure 5. Water meter (ІРКА)

B.1. Types of metering equipment:
Table 5 lists electrical and flow meters utilized to measure energy consumption, supplied water and pumped sewage.

Table 5. Electrical meters and flow meters.

Meter type	Manufacturer
Electrical meter СТК3-05Q2E3M	Telekard-Pribor Ltd., Odessa
Electrical meter СТК3-10Q2H6Mt	NIK-Elektronika Ltd., Kyiv
Electrical meter СА4Уи672М	JSC 'LEMZ,' Saint-Petersburg
Electrical meter СР4Уи673М	JSC 'LEMZ,' Saint-Petersburg
Electrical meter СТК-1	Telekard-Pribor Ltd., Odessa
Electrical meter AA05RALX-B-4	Company 'Elster Metronika,' Moscow
Electrical meter A1805RAL-P43B	Company 'Elster Metronika,' Moscow
Electrical meter СА3У-5009	Close Corporation 'Company 'Rostok", Kyiv
Electrical meter СР4Уи689	JSC 'LEMZ,' Saint-Petersburg
Electrical meter НІК2303АРП1	NIK-Elektronika Ltd., Kyiv
Electrical meter СТК3-10Q2H4M	Telekard-Pribor Ltd., Odessa
Electrical meter SL7000	Schlumberger Industries, France
Electrical meter СТК3-10Q2H6M	Telekard-Pribor Ltd., Odessa
Electrical meter СТК1-10К510St	Telekard-Pribor Ltd., Odessa
Electrical meter EA05CLP2C-3	Company 'Elster Metronika,' Moscow
Electrical meter СА4-и678	JSC 'LEMZ,' Saint-Petersburg
Heat and water meter (СІЧ-Узв)	Firm 'Rodnik-UT' Ukraine, Zaporizhzhia
Water meter УЗР-В	Ltd. "Metropolys" Ukraine, Kharkov
Water meter Расход-7	Firm "Stolend" Ukraine, Nikolaev
Water meter ІРКА	"NPP IRVIS" Ukraine, Kharkov
Water meter УВР-011	JSC "Enerhouchet" Ukraine Kharkov

B.1.1. Information on accuracy class of meters used by MU 'Vodokanal' departments and subdivisions:

According to the Law of Ukraine "On metrology and metrological activities,"[4] every piece of measuring equipment in Ukraine shall be compliant with stated requirements or related standards and is subject to regular verification.

[4] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1765-15

Table 6. Types of water and electrical meters, their calibration/verification frequency.

List of MU 'Vodokanal' meters (electrical meters)	Class of accuracy,%	Verification frequency, years	Verification date (month/year)	Next verification date (month/year)
Electrical meter A1805RAL-P4G-DW-4	0.5	6	01.2008	01.2014
Electrical meter A1805RAL-P4G-DW-4	0.5	6	01.2008	01.2014
Electrical meter A1805RAL-P4G-DW-4	0.5	6	01.2008	01.2014
Electrical meter A1805RAL-P4G-DW-4	0.5	6	01.2008	01.2014
Electrical meter A1805RAL-P4G-DW-4	0.5	6	01.2008	01.2014
Electrical meter SL7000	1	6	03.2007	03.2013
Electrical meter SL7000	1	6	03.2007	03.2013
Active power meter СА4Уи672М	2	4	01.2010	01.2014
Reactive power meter СР4Уи673М	2	4	01.2010	01.2014
Active power meter СА4Уи672М	2	4	02.2010	02.2014
Reactive power meter СР4Уи673М	2	4	02.2010	02.2014
Electrical meter AA05RALX-B-4	1	6	03.2006	03.2010
Electrical meter AA05RALX-B-4	1	6	03.2006	03.2010
Electrical meter НИК2303	1	6	01.2010	01.2016
Electrical meter НИК2303	1	6	02.2009	02.2015
Electrical meter СТК3-10Q2H4.K4t	1	6	02.2009	02.2015
Electrical meter НИК2303	1	6	04.2009	04.2015
Active power meter СА4Уи672М	2	4	01.2009	01.2013
Reactive power meter СР4Уи673М	2	4	03.2008	03.2012
Electrical meter A1805RAL-P4G-DW-4	1	6	01.2008	01.2014
Electrical meter A1805RAL-P4G-DW-4	1	6	01.2008	01.2014

Active power meter СА4Уи672М	2	4	01.2009	01.2013
Reactive power meter СР4Уи673М	2	4	03.2008	03.2012
Active power meter СА4Уи672М	2	4	02.2007	02.2011
Reactive power meter СР4Уи673М	2	4	03.2007	03.2011
Active power meter СА4Уи672М	2	4	02.2007	02.2011
Reactive power meter СР4Уи673М	2	4	03.2007	03.2011
Active power meter СА4Уи672М	2	4	02.2007	02.2011
Reactive power meter СР4Уи673М	2	4	03.2007	03.2011
Active power meter СА4Уи672М	2	4	04.2009	04.2013
Reactive power meter СР4Уи673М	2	4	04.2010	04.2014
Electrical meter A1140RALBW4T	1	6	04.2009	04.2015
Active power meter СА-199	2	4	02.2009	02.2013
Electrical meter SL7000	1	6	04.2008	04.2014
Electrical meter SL7000	1	6	04.2008	04.2014
Active power meter СА4-5001	2	4	02.2010	02.2014
Electrical meter Дельта 8010-06	1	6	01.2009	01.2015
Electrical meter СТК-1	1	6	01.2006	01.2012
Active power meter СА4Уи672М	2	4	03.2010	03.2014
Electrical meter A1140RAL-BW-4T	1	6	03.2008	03.2014
Active power meter СА4-195	2	4	03.2010	03.2014
Active power meter СА4Уи672М	2	4	04.2008	04.2012
Active power meter СА4Уи672М	2	4	04.2008	04.2012
Electrical meter A1805RAL-P4G-DW-4	1	6	03.2008	03.2014
Electrical meter A1805RAL-P4G-DW-4	1	6	03.2008	03.2014
Electrical meter SL7000	1	6	04.2008	04.2014
Active power meter СА4Уи672М	2	4	02.2008	02.2012
Electrical meter SL7000	1	6	04.2008	04.2014
Electrical meter SL7000	1	6	04.2008	04.2014
Electrical meter A1140RAL-BW-4T	1	6	02.2010	02.2016

Electrical meter A1140RAL-BW-4T	1	6	02.2010	02.2010
Electrical meter СТК3-05Q2E3M	0.5	6	01.2008	01.2014
Electrical meter A1140RAL-BW-4T	1	6	04.2008	04.2014
Active power meter СА3У-5009	2	4	03.2007	03.2011
Reactive power meter СР4Уи689	2	4	03.2007	03.2011
Active power meter СА4Уи672М	2	4	01.2008	01.2012
Reactive power meter СР4Уи673М	2.	4	01.2008	01.2012
Electrical meter СТК3-05Q2E3M	0.5	6	03.2005	03.2011
Electrical meter СТК3-05Q2E3M	0.5	6	03.2005	03.2011
Electrical meter НІК2303АРП1Т	1	6	04.2009	04.2015
Active power meter СА4Уи672М	2	4	02.2007	02.2011
Reactive power meter СР4Уи673М	2	4	02.2007	02.2011
Active power meter СА4Уи672М	2	4	02.2007	02.2011
Reactive power meter СР4Уи673М	2	4	02.2007	02.2011
Active power meter СА4Уи672М	2	4	04.2008	04.2012
Reactive power meter СР4Уи673М	1	6	03.2008	03.2014
Active power meter СА4Уи672М	2	4	02.2008	02.2012
Reactive power meter СР4Уи673М	2	4	02.2008	02.2012
Active power meter СА4Уи672М	2	4	02.2008	02.2012
Reactive power meter СР4Уи673М	2	4	02.2008	02.2012
Electrical meter Дельта 8010-08	1	6	02.2008	02.2014
Electrical meter Дельта 8010-06	1	6	02.2008	02.2014
Electrical meter Дельта 8010-06	1	6	02.2008	02.2014
Electrical meter НІК 2303АРК1	1	6	04.2010	04.2016
Electrical meter A1140RAL-BW-4T	1	6	02.2010	02.2016
Electrical meter EA05RAL-P3B-4	1	6	02.2010	02.2016
Electrical meter EA05RAL-P3B-4	1	6	02.2010	02.2016
Electrical meter A1805RAL-P4G-DW-4	1	6	03.2008	03.2014
Electrical meter A1805RAL-P4G-DW-4	1	6	03.2008	03.2014

Active power meter СА4Уи672М	2	4	01.2007	01.2011
Reactive power meter СР4Уи673М	2	4	01.2007	01.2011
Active power meter СА4Уи672М	2	4	01.2007	01.2011
Reactive power meter СР4Уи673М	2	4	01.2007	01.2011
Electrical meter СТК3-10Q2H6Mt	1	6	01.2008	01.2014
Electrical meter СТК3-10Q2H6Mt	1	6	01.2008	01.2014
Active power meter СА4Уи672М	2	4	03.2007	03.2011
Reactive power meter СР4Уи673М	2	4	03.2007	03.2011
Reactive power meter СР4Уи673М	2	4	01.2007	01.2011
Active power meter СА4Уи672М	2	4	03.2007	03.2011
Reactive power meter СР4Уи673М	2	4	03.2007	03.2011
Reactive power meter СР4Уи673М	2	4	03.2007	03.2011
Active power meter СА4Уи672М	2	4	01.2007	01.2011
Reactive power meter СР4Уи673М	2	4	04.2010	04.2014
Active power meter СА4Уи672М	2	4	01.2007	01.2011
Reactive power meter СР4Уи673М	2	4	04.2010	04.2014
Active power meter СА4Уи672М	2	4	03.2007	03.2011
Reactive power meter СР4Уи673М	2	4	01.2008	01.2012
Active power meter СА4Уи672М	2	4	04.2010	04.2014
Reactive power meter СР4Уи673М	2	4	04.2010	04.2014
Active power meter СА4Уи672М	2	4	02.2010	02.2014
Reactive power meter СР4Уи673М	2	4	02.2010	02.2014
Active power meter СА4Уи672М	2	4	02.2009	02.2013
Active power meter СА4Уи672М	1	6	03.2010	03.2016
Active power meter СА4Уи672М	2	4	04.2010	04.2014
Reactive power meter СР4Уи673М	2	4	04.2010	04.2014
Active power meter СА4Уи672М	2	4	04.2008	04.2012
List of MU 'Vodokanal' meters (flow meters)	**Class of accuracy, %**	**Calibration frequency**	**Calibration date (month/year)**	**Next calibration date (month/year)**
Січ-Узв	±2 ÷ ±3	2	06.2009	06.2011

Січ-Узв	±2 ÷ ±3	2	06.2009	06.2011
Січ-Узв	±2 ÷ ±3	2	04.2009	04.2011
Січ-Узв	±2 ÷ ±3	2	04.2009	04.2011
ІРКА	±1 ÷ ±3	2	02.2010	02.2012
ІРКА	±1 ÷ ±3	2	02.2010	02.2012
ІРКА	±1 ÷ ±3	2	02.2010	02.2012
ІРКА	±1 ÷ ±3	2	02.2010	02.2012
Січ-Узв	±2 ÷ ±3	2	03.2009	03.2011
Січ-Узв	±2 ÷ ±3	2	03.2009	03.2011
Січ-Узв	±2 ÷ ±3	2	03.2009	03.2011
Січ-Узв	±2 ÷ ±3	2	04.2009	04.2011
Січ-Узв	±2 ÷ ±3	2	04.2009	04.2011
Січ-Узв	±2 ÷ ±3	2	04.2009	04.2011
Січ-Узв	±2 ÷ ±3	2	03.2009	03.2011
Січ-Узв	±2 ÷ ±3	2	04.2009	04.2011
Січ-Узв	±2 ÷ ±3	2	03.2009	03.2011
Січ-Узв	±2 ÷ ±3	2	04.2009	04.2011
Січ-Узв	±2 ÷ ±3	2	06.2009	06.2011
Січ-Узв	±2 ÷ ±3	2	06.2009	06.2011
Січ-Узв	±2 ÷ ±3	2	09.2009	09.2011
Січ-Узв	±2 ÷ ±3	2	09.2009	09.2011
Січ-Узв	±2 ÷ ±3	2	09.2009	09.2011
УЗР-В	±1 ÷ ±1,5	1	06.2010	06.2011
УЗР-В	±1 ÷ ±1,5	1	06.2010	06.2011
УЗР-В	±1 ÷ ±1,5	1	06.2010	06.2011
УЗР-В	±1 ÷ ±1,5	1	06.2010	06.2011
УЗР-В	±1 ÷ ±1,5	1	06.2010	06.2011
УЗР-В	±1 ÷ ±1,5	1	06.2010	06.2011
УЗР-В	±1 ÷ ±1,5	1	06.2010	06.2011

Расход-7	±1,5	1	09.2010	09.2011
Расход-7	±1,5	1	09.2010	09.2011
УЗР-В	±1 ÷ ±1,5	1	09.2010	09.2011
УЗР-В	±1 ÷ ±1,5	1	09.2010	09.2011
УЗР-В	±1 ÷ ±1,5	1	08.2010	08.2011
УЗР-В	±1 ÷ ±1,5	1	03.2010	03.2011
УЗР-В	±1 ÷ ±1,5	1	03.2010	03.2011
ІРКА	±1 ÷ ±3	2	08.2009	08.2011
УЗР-В	±1 ÷ ±1,5	1	09.2010	09.2012
Січ-Узв	±2 ÷ ±3	2	09.2010	09.2012
УВР-011	±1,5 ÷ ±4	2	12.2010	12.2012
ЭМИСС	±2	1	10.2010	10.2011
УВР-011	±1,5 ÷ ±4	2	11.2009	11.2011
УВР-011	±1,5 ÷ ±4	2	10.2009	10.2011
УВР-011	±1,5 ÷ ±4	2	10.2009	10.2011
УВР-011	±1,5 ÷ ±4	2	02.2009	02.2011
Січ-Узв	±2 ÷ ±3	2	11.2009	11.2011
УВР-011	±1,5 ÷ ±4	2	06.2009	06.2011
УВР-011	±1,5 ÷ ±4	2	06.2009	06.2011
УВР-011	±1,5 ÷ ±4	2	06.2009	06.2011
УВР-011	±1,5 ÷ ±4	2	10.2009	10.2011
Січ-Узв	±2 ÷ ±3	2	11.2009	11.2011

B.1.2. Third Parties involvement:

Measuring equipment has been calibrated and verified by the State Enterprise 'Zaporizhzhia Research and Production Centre for Standardisation, Metrology and Certification.'

B.2. Data collection (summary data for the whole monitoring period):

Data used for calculation of emission reduction are given in the Table of Section B.2.1 'List of constant, variable and provided values' and in Annex 2 (Calculation of tCO2e emission reduction within the MU 'Vodokanal' system) attached on electronic media to the present Monitoring Report.

Table in Section B.2.1 contains all the parameters required for emission reduction calculation of the present Monitoring Report.

B.2.1 List of constant, variable and provided values:

Table 7. List of constant, variable and provided values.

No.	Symbol	Parameter	Units	Measured (m), calculated (c) or estimated (e)	Remarks
1	$EF_{CO2,ELEC}$	Carbon dioxide emission factor for electricity consumption for electrical network of Ukraine	tCO_2e/ MW*hour	e	Constant for 2010 "Emission factors for Ukrainian electric network"
2	M^3_{wb}	Total amount of water supplied in base year.	m^3	m	Historical value as of 2004, unchanged over the entire crediting period
3	$M^3_{i, wr}$	Amount of water transported through water supply system 'i' during project year.	m^3	m	Is subject to regular monitoring
4	M_{vb}	Overall amount of pumped sewage, during base year.	m^3	m	Historical value as of 2004, unchanged over the entire crediting period
5	$M^3_{i, vr}$	Amount of sewage pumped through water disposal system 'i' during project year.	m^3	m	Is subject to regular monitoring
6	kWh_{wb}	Total electrical energy required to transport water during base year.	kW*hour	m	Historical value as of 2004, unchanged over the entire crediting period

7	$kWh_{i\ wr}$	Electrical energy required to transport water through water supply system 'i' during project year.	kW*hour	m	Is subject to regular monitoring
8	kWh_{vb}	Total electrical energy required to transport sewage during base year.	kW*hour	m	Historical value as of 2004, unchanged over the entire crediting period
9	$kWh_{i\ vr}$	Electrical energy required to transport sewage through water disposal system 'i' during project year.	kW*hour	m	Is subject to regular monitoring

Table 8. Historical values of transported water amount, pumped sewage and consumed electric energy over 2004 for shops and pumping stations of MU 'Vodokanal' (stable value for the entire crediting period).

No.	**Water supply facilities**	Baseline (historical value as of 2004)	
		$M^3_{i\ wb}$ (thousand m3/year)	**$kWh_{i\ wb}$** (thousand kWh*hour (MWh*hour))
1	**Dnipro Water Supply Plant No.1**	55158.41	45423.98
2	**Dnipro Water Supply Plant No. 2**	15937.06	14346.76
3	**Shop 1**	**23116.44**	**7388.98**
	including		
3.1	Khortytska Pumping Station	17268.40	6922
3.2	Inturyst Pumping Station	1462.01	323.31
3.3	Sotsgorod Pumping Station	4386.02	143.67
4	**Shop 2**	**9985.57**	**7819.88**
	including		
4.1	Levanevska Pumping Station	8556.64	6977.84
4.2	Kosmichna Pumping Station	119.25	29.14
4.3	Lakhty Pumping Station	269.34	49.19
4.4	Zaliznychna Pumping Station	283.72	31.02
4.5	ЦТП-4 (Central Heating Station-4) Pumping	448.21	479.38
4.6	ЦТП-9 (Central Heating Station-9) Pumping	308.41	253.31
5	**Shop 3**	**10576.40**	**7906.10**
	including		
5.1	Shevchenko Pumping Station	7737.22	6137.05
5.2	8 Bereznia Pumping Station	372.51	29.15
5.3	Chervona Pumping Station	522.46	128.57
5.4	Omelchenko Pumping Station	470.89	212.29
5.5	Mokra Pumping Station	613.14	402.65
5.6	Aeroport Pumping Station	271.12	374.74
5.7	Pivdenna Pumping Station	589.05	621.65
6	**Shop 4**	**6504.27**	**4982.78**

	including		
6.1	Pavlo-Kichkas Pumping Station	3104.36	1785.81
6.2	Skvortsova Pumping Station	100.65	87.73
6.3	Istorychna Pumping Station	101.98	711.32
6.4	Volniansk Pumping Station	3197.28	2397.92
7	**Shop 5**	**818.01**	**496.64**
	including		
7.1	Balabino Pumping Station	163.70	183.54
7.2	Kushugum Pumping Station	81.36	4.43
7.3	Lezheno Pumping Station	491.11	260.85
7.4	Lukashevo Pumping Station	81.85	47.82
	Water supply total	**122096.15**	**88365.12**
	Water disposal facilities	**$M^3_{i\,vb}$** (thousand m3/year)	**$kWh_{i\,v\,b}$** (thousand kWh*hour (MWh*hour))
8	Sewage Pumping Station No.1	23264.68	9281.39
9	Sewage Pumping Station No.2	6787.21	3231.43
10	Sewage Pumping Station No.3	902.96	767.52
11	Sewage Pumping Station No.4	2200.90	938.38
12	Sewage Pumping Station No.6	2562.77	1270.87
13	Sewage Pumping Station No.7	3198.29	2076.83
14	Sewage Pumping Station No.8	892.86	504.07
15	Sewage Pumping Station No.9	3222.98	1514.62
16	Sewage Pumping Station No.10	37.77	198.79
17	Sewage Pumping Station No.11	114.05	170.15
18	Sewage Pumping Station No.12	254.85	184.19
19	Sewage Pumping Station No.14	45.85	168.02
20	Sewage Pumping Station No.16	72.73	188.86
21	Sewage Pumping Station No.21	149.28	168.02
22	Sewage Pumping Station No.22	1791.95	441.68
23	Sewage Pumping Station No.23	5091.50	3344.86
24	Sewage Pumping Station No.24	1882.60	3779.17
25	Sewage Pumping Station No.25	48.39	363.27
26	Sewage Pumping Station No.28	276.94	234.78
27	Sewage Pumping Station No.29	536.81	745.68
28	Sewage Pumping Station No.30	431.32	704.85
29	Sewage Pumping Station No.32	420.14	285.28
30	Sewage Pumping Station No.33	396.25	324.98
31	Sewage Pumping Station No.34	543.18	309.82
32	Sewage Pumping Station No.35	365.08	168.45
33	Sewage Pumping Station No.36	172.67	148.17
34	Sewage Pumping Station No.37	59.39	171.71
35	Sewage Pumping Station No.46	44.58	172.28
	Water disposal total	**55768.00**	**31858.12**

Table 9. Total values of transported water, pumped sewage and consumed electrical power during reporting year of for shops and pumping stations of MU 'Vodokanal'.

No.	**Water supply facilities**	Project year of 2010	
		$M^3_{i\ wr}$ (thousand m3/year)	**$kWh_{i\,wr}$** (thousand kWh*hour (MWh*hour))
1	**Dnipro Water Supply Plant No.1**	34999.04	10176.90

2	**Dnipro Water Supply Plant No. 2**	16827.76	1624.92
3	**Shop 1**	**22931.51**	**1899.94**
	including		
3.1	Khortytska Pumping Station	17984.23	1568.96
3.2	Inturyst Pumping Station	1271.85	172.68
3.3	Sotsgorod Pumping Station	3675.43	158.31
4	**Shop 2**	**12303.10**	**1681.15**
	Including		
4.1	Levanevska Pumping Station	11647.16	1533.90
4.2	Kosmichna Pumping Station	63.44	10.65
4.3	Lakhty Pumping Station	63.44	8.08
4.4	Zaliznychna Pumping Station	63.44	10.80
4.5	CHS-4 Pumping Station	264.32	68.56
4.6	CHS-9 Pumping Station	201.3	49.16
5	**Shop 3**	**8939.65**	**691.28**
	including		
5.1	Shevchenko Pumping Station	7272.82	523.41
5.2	8 Bereznia Pumping Station	15.17	4.27
5.3	Chervona Pumping Station	388.85	11.31
5.4	Omelchenko Pumping Station	376.76	23.06
5.5	Mokra Pumping Station	426.41	50.69
5.6	Aeroport Pumping Station	24.57	41.11
5.7	Pivdenna Pumping Station	435.07	37.44
6	**Shop 4**	**4851.75**	**1906.40**
	including		
6.1	Pavlo-Kichkas Pumping Station	2429.38	476.40
6.2	Skvortsova Pumping Station	73.83	19.51
6.3	Istorychna Pumping Station	11.11	5.12
6.4	Volniansk Pumping Station	2337.43	1405.36
7	**Shop 5**	**801.29**	**402.04**
	including		
7.1	Balabino Pumping Station	155.9	238.96
7.2	Kushugum Pumping Station	103.92	10.69
7.3	Lezheno Pumping Station	487.03	114.45
7.4	Lukashevo Pumping Station	54.44	37.94
Water supply total		**101654.10**	**18382.63**
	Water disposal facilities	**$M^3_{i\,vr}$** (thousand m3/year)	**$kWh_{i\,vr}$** (thousand kWh*hour (MWh*hour))
8	Sewage Pumping Station No.1	18539.47	2751.686
9	Sewage Pumping Station No.2	6900.98	1382.09
10	Sewage Pumping Station No.3	355.97	273.756
11	Sewage Pumping Station No.4	1547.12	493.156
12	Sewage Pumping Station No.6	5724.73	668.116
13	Sewage Pumping Station No.7	4204.54	965.906
14	Sewage Pumping Station No.8	1208.18	167.566
15	Sewage Pumping Station No.9	2762.95	552.566
16	Sewage Pumping Station No.10	31.9	55.636
17	Sewage Pumping Station No.11	26.93	74.886
18	Sewage Pumping Station No.12	66.3	70.466

19	Sewage Pumping Station No.14	68.34	77.476
20	Sewage Pumping Station No.16	43.64	65.696
21	Sewage Pumping Station No.21	91.08	59.606
22	Sewage Pumping Station No.22	1139.41	244.816
23	Sewage Pumping Station No.23	4596.47	1348.656
24	Sewage Pumping Station No.24	2815.34	1655.406
25	Sewage Pumping Station No.25	210.94	171.086
26	Sewage Pumping Station No.28	62.15	76.836
27	Sewage Pumping Station No.29	1251.69	353.556
28	Sewage Pumping Station No.30	1606.88	387.576
29	Sewage Pumping Station No.32	320.18	92.546
30	Sewage Pumping Station No.33	145.26	89.176
31	Sewage Pumping Station No.34	968.59	200.526
32	Sewage Pumping Station No.35	258.57	63.076
33	Sewage Pumping Station No.36	53.35	45.766
34	Sewage Pumping Station No.37	68.87	69.796
35	Sewage Pumping Station No.46	53.17	80.476
Water disposal total		**55123.00**	**12537.90**

B.2.2. Data relating to GHG emissions by sources of project activity:

Table 10. Parameters relating to GHG emissions by sources of project activity.

Symbol	Parameter	Units	Measured (M), calculated (C) or estimated (E)
$\mathbf{M^3_{i,\,wr}}$	Amount of water transported through water supply system 'i' during project year.	m^3	M
$\mathbf{M^3_{i,\,vr}}$	Amount of sewage pumped through water disposal system 'i' during project year.	m^3	M
$\mathbf{kWh_{\,i\,wr}}$	Electrical energy required to transport water through water supply system 'i' during project year.	kW*hour	M
$\mathbf{kWh_{\,i\,vr}}$	Electrical energy required to transport sewage through water disposal system 'i' during project year.	kW*hour	M

B.2.3. Data relating to GHG emissions by the sources of baseline scenario:

Table 11. Parameters relating to GHG emissions by sources of baseline scenario.

Symbol	Parameter	Units	Measured (M), calculated (C) or estimated (E)
$\mathbf{M^3_{wb}}$	Total amount of water transported through water supply system in base year.	m^3	M
$\mathbf{M^3_{vb}}$	Overall amount of sewage pumped through water disposal system during base year.	m^3	M

$M^3_{i, wr}$	Amount of water transported through water supply system 'i' during project year.	m^3	M
$M^3_{i, vr}$	Amount of sewage pumped through water disposal system 'i' during project year.	m^3	M
kWh_{wb}	Total electrical energy required to transport water through water supply system during base year.	kW*hour	M
kWh_{vb}	Total electrical energy required to pump sewage through water disposal system during base year.	kW*hour	M

B.2.4. Data on leakage:

Indirect leakages of CO2, CH4, N2O due to fuel removal and hauling are excluded. The mentioned leakages are not subject to monitoring by MU 'Vodokanal' (it is impossible to estimate leakage amount), therefore they were excluded.

B.2.5. Data related to environmental and social effect:

In accordance with the legislative environment of Ukraine 'On environmental protection'[5] the MU 'Vodokanal' is not obliged to analyze the environmental impact assessment for this type of project.

The only influence on the environment lies in dismantled equipment, which will be further utilized as secondary raw materials.

Implementation of this project upgrades quality of water supply and drainage for consumers of the Zaporizhzhia city. Experience of MU 'Vodokanal' employees and application norms of the Law of Ukraine 'On drinking water and drinking water supply' made it possible to reduce to a minimum the possibility of emergency situations in the course of this project implementation.

Transboundary impacts of project activities, as they are determined in the text of 'Convention on Long-Range Transboundary Air Pollution' ratified by Ukraine, do not take place.

The MU 'Vodokanal' has special water use authorizations for all areas and types of activities.

Impact on aquatic environment

There is no impact on the aquatic environment.

Impact on air environment

There is no impact on the air environment.

Impact on land use

There is no impact on land /soils use.

B.3. Data processing and archiving:

All data are processed and archived in electronic and/or paper form.

B.4. Emergency and process disturbances:

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

No emergencies were observed at the MU 'Vodokanal' over 12 months (from 1 January 2010 through 31 December 2010).

B.5. Procedures of detection and elimination of malfunctions at the MU 'Vodokanal':

In case of any equipment malfunction detected operator shall notify pumping station supervising foreman. If it is impossible to immediately eliminate such malfunction (absence of necessary part, breakdown of engine, etc.) a committee shall be established to include 6-7 employees of the Engineering Department, chief engineer, shift leader and leading engineers. A punch list or accident evaluation report shall be drawn up according to malfunction type, and equipment shall be repaired.

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

The only type of external data that is used in the monitoring of GHG emissions at MU 'Vodokanal' is Carbon dioxide Emission Factor for Ukrainian electrical supply network as per regulation from the Ukrainian legislation, in particular Order of the National Agency of Ecological Investments of Ukraine 'On approval of indexes for carbon dioxide specific emissions' dated 2010. No other external data for emissions monitoring under the project are used.

B.7. Error level of metering equipment:

Error level shall be determined for each type of metering equipment. This level is mainly low. Level of imprecision of electric meters is up to 2%.
Revenue metering devices installed at MU 'Vodokanal' meet the criterion stated above.
Level of water flow meters imprecision is up to 3%.
Water flow meters installed at MU 'Vodokanal' meet the criterion stated above.
Permissible error of the listed measurements, which is not corrected in further calculations, is regulated.

SECTION C. Quality assurance and quality control measures

C.1. Documented procedures and management structure:

C.1.1. Roles and responsibilities:

The project shall be managed by MU 'Vodokanal' Director General and his First Deputy. Director shall supervise and coordinate activities of all departments. Individual department lead by its Head shall be responsible for each parameter.
JI Project Manager, MU ‘Vodokanal’ Engineering Department Deputy Head, Mr.Volodymyr Tkachuk, performs control and check of adequacy of data collection mechanism, as well as reliability of Monitoring Plan parameters, and other information concerning project implementation.

Structure of monitoring data collection is presented as follows:

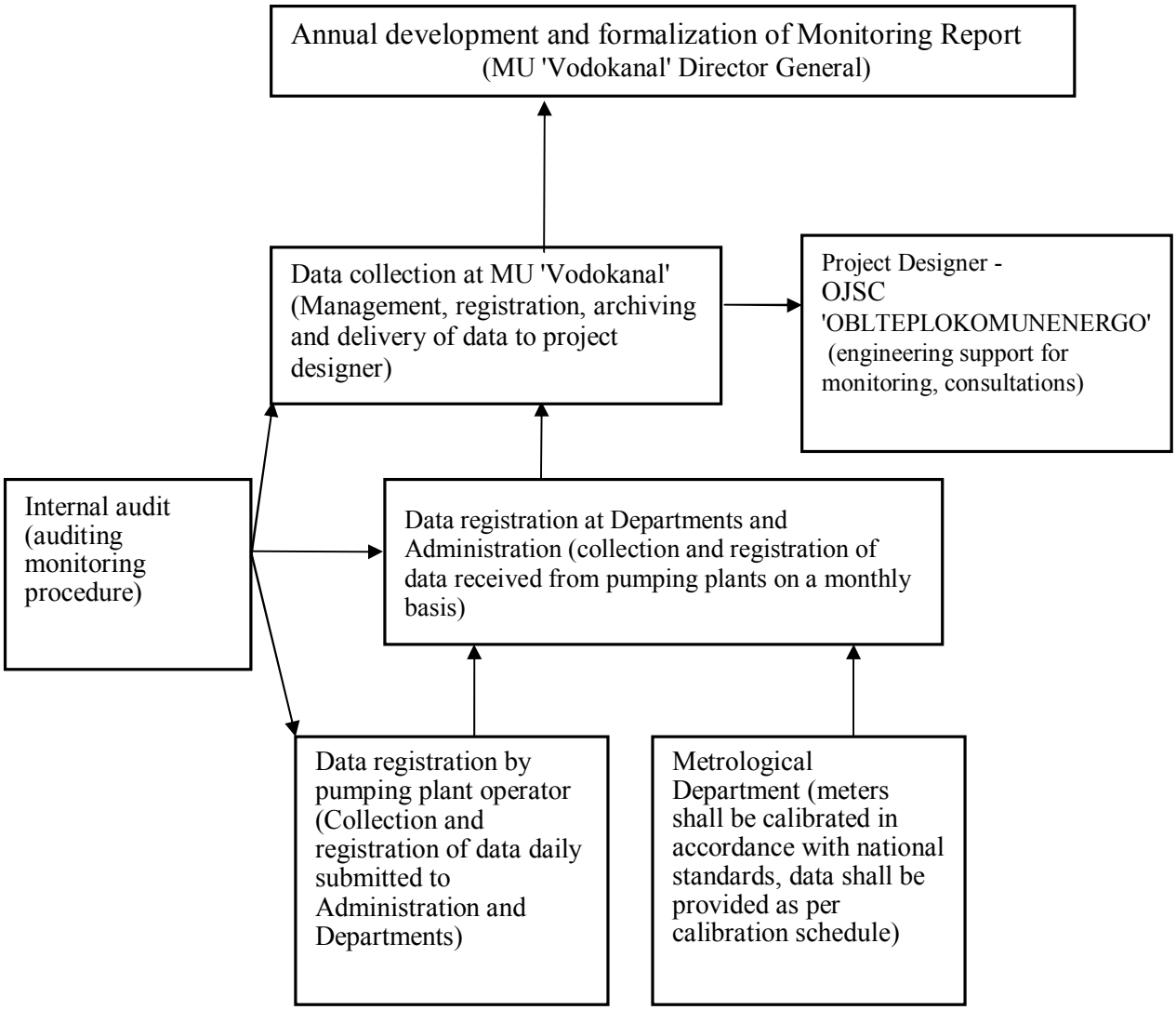

Figure 3. Monitoring data collection structure

C.1.2. Trainings:

Since principal activities of MU 'Vodokanal' have not changed with execution of the Joint Implementation (JI) project, special engineering trainings of personnel are not required. Technical personnel of the enterprise possess necessary knowledge and experience to execute the project and repair standard equipment.

In case of new equipment installation (such that has not been operated at this enterprise before, for instance: new pumping equipment), manufacturer of the equipment shall deliver training to personnel. During the monitoring period, equipment requiring special training of personnel was not installed.

MU 'Vodokanal' retrains personnel as required by of Labour Protection Norms. The enterprise has the Labour Protection Department responsible for professional development and trainings of personnel.

During 2010, usual for the entity re-training of officials and experts in labour protection took place at the UC 'Vodokanal'. Schedule of officials and experts re-training in labour protection is presented in Table 12.

Table 12. Schedule of MU 'Vodokanal' officials and experts re-training in labour protection.

No.	Position	Number of people
		2010 year
1.	Managers	69
2.	Specialists	160
3.	Experts	27
	Total	256

C.2. Stakeholder comments:

Since project activities do not imply any negative environmental impact or negative social effect, special public discussions were not required. Consultations with Stakeholders were conducted at the meetings of state and local authorities.

No comments were received from Stakeholders.

C.3. Internal audits and control measures:

Measuring equipment used for monitoring shall be subject to regular state verification. MU 'Vodokanal' water flow and electrical meters were calibrated by the State Enterprise 'Zaporizhzhia Research and Production Centre for Standardisation, Metrology and Certification.'

MU 'Vodokanal' personnel are subject to requirements knowledge assessment:

- data collection as per Monitoring Report Schedule (monitoring data collection is in line with common data collection practice aimed at payment for consumed energy and transported water);
- labour protection;
- safety measures during operation of pumping equipment system.

JI Project Manager, MU 'Vodokanal' Engineering Department Deputy Head, Mr.Volodymyr Tkachuk, performs control and check of adequacy of data collection mechanism, as well as reliability of Monitoring Plan parameters, and other information concerning project implementation.

SECTION D. Calculation of GHG emission reductions

This section contains documented formulas applied for calculation of project emissions, baseline emissions and total emission reductions.

D. 1.1. Overall emission reductions

Formula 1 - Number of Emission Reduction Units (ER)	
	$ER = E^b - E^r$
	E^b and E^r - GHG emissions occurring as a result of energy and water consumption, and water disposal, in base and reporting year respectively, tCO_2e; $[_b]$ index - applicable to base year; $[_r]$ index - applicable to reporting year.

D.1.2. Project emissions

Formula 3 - Annual project emissions (E^{wr}) within water supply system	
	$E^{wr} = kWh_{wr} * EF$
	where: EF- carbon dioxide emission factor (EF) applicable to Ukraine as per regulation from the Ukrainian legislation, in particular Order of the National Agency of Ecological Investments of Ukraine 'On approval of indexes for carbon dioxide specific emissions dated 2010'; kWh_{wr} - total electrical energy required to transport water through water supply system during project year, (kW*hour); $[_r]$ index - applicable to reporting year.

Formula 5 - total electrical energy required to transport water during year 'y' of the project scenario, (kW*hour)	
	$kWh_{wr} = \sum kWh_{wr,i}$
	$kWh_{wr,i}$ - electrical energy required to transport water through water supply system 'i' during project year, (kW*hour); $[_i]$ index – standalone water supply system; $[_r]$ index - applicable to reporting year.

Formula 8 - Annual project emissions (E^{vr}) within water disposal system	
	$E^{vr} = kWh_{vr} * EF$
	where: EF- carbon dioxide emission factor (EF) applicable to Ukraine as per regulation from the Ukrainian legislation, in particular Order of the National Agency of Ecological Investments of Ukraine 'On approval of indexes for carbon dioxide specific emissions dated 2010; kWh_{vr} - total electrical energy required to transport sewage through water disposal system during project year, (kW*hour); [r] index - applicable to reporting year.

Formula 10 - total electrical energy required to transport sewage through water disposal system during year 'y' of the project scenario, (kW*hour)	
	$kWh_{vr} = \sum kWh_{vr,i}$
	$kWh_{vr,i}$ - electrical energy required to transport sewage through water disposal system 'i' during project year, (kW*hour); [i] index – standalone water disposal system; [r] index - applicable to reporting year.

D.1.3. Baseline emissions

Formula 2 - Annual baseline emissions (E^{wb}) within water supply system	
	$E^{wb} = M^3_{wr} * PPER * EF$
	PPER- pre-project efficiency factor, (kW*hour/m^3); EF- carbon dioxide emission factor (EF) applicable to Ukraine as per regulation from the Ukrainian legislation, in particular Order of the National Agency of Ecological Investments of Ukraine 'On approval of indexes for carbon dioxide specific emissions dated 2010'; M^3_{wr} - total amount of water supplied through water supply system during project year, (m^3); [b] index - applicable to base year; [r] index - applicable to reporting year.

Formula 4 - pre-project efficiency factor, (kW*hour/m^3) for water supply system	
	$PPER = kWh_{wb} / M^3_{wb}$
	kWh_{wb} - total electrical energy required to transport water through water supply system during base year, (kW*hour); M^3_{wb} - total amount of water supplied through water supply system during base year, (m^3); [b] index - applicable to base year.

Formula 6 - total amount of water supplied in project year, (m^3)	
	$M^3_{wr} = \sum M^3_{i, wr}$
	$M^3_{i, wr}$ - amount of water supplied by water supply system 'i' in project year, (m^3); [i] index – standalone water supply system; [r] index - applicable to reporting year.

Formula 7 - Annual baseline emissions (E^{vb}) within water disposal system	
	$E^{vb} = M^3_{vr} * PPER * EF$
	PPER- pre-project efficiency factor, kW*hour/m^3; EF- carbon dioxide emission factor (EF) applicable to Ukraine as per regulation from the Ukrainian legislation, in particular Order of the National Agency of Ecological Investments of Ukraine 'On approval of indexes for carbon dioxide specific emissions dated 2010'; M^3_{vr} - total sewage amount pumped by water disposal system during project, (m^3); [r] index - applicable to reporting year.

Formula 9 - pre-project efficiency factor, (kW*hour/m^3) for water disposal system	
	$PPER = kWh_{vb} / M^3_{vb}$
	kWh_{vb} - total electrical energy required to transport water within water disposal system during base year, (kW*hour); M^3_{vb} - total sewage amount pumped by water disposal system during base year, (m^3); [b] index - applicable to base year.

Formula 11 - total sewage amount pumped during project year, (m^3)	
	$M^3_{vr} = \sum M^3_{i, vr}$
	$M^3_{i, vr}$ - sewage amount pumped by water disposal system 'i' during project year, (m^3); [$_i$] index – standalone water disposal system; [$_r$] index - applicable to reporting year.

Tables 13 and 14 provide total values of parameters used to calculate GHG emission reduction for reporting period.

Table 13. Historical values of parameters (2004) used to calculate GHG emission amount based on baseline (summary data on MU 'Vodokanal').

MU 'Vodokanal'	Baseline (historical values as of 2004)		
Water supply system	M^3_{wb} (thousand m3/year)	kWh_{wb} (thousand kWh*hour (MWh*hour))	EF
2004	122096.15	88365.12	0.896
Water disposal system	M^3_{vb} (thousand m3/year)	kWh_{vb} (thousand kWh*hour (MWh*hour))	EF
2004	55768.00	31858.12	0.896

Table 14. Values of parameters used to calculate GHG emission amount based on project scenario in reporting year of 2010 (summary data on MU 'Vodokanal').

MU 'Vodokanal'	Project year of 2010		
Water supply system	M^3_{wr} (thousand m3/year)	kWh_{wr} (thousand kWh*hour (MWh*hour))	EF
2010	101654.10	18382.63	1.225
Water disposal system	M^3_{vr} (thousand m3/year)	kWh_{vr} (thousand kWh*hour (MWh*hour))	EF
2010	55123.00	12537.90	1.225

Measures implemented under the project over the reporting period resulted in the following GHG emission amounts:

Table 15.Project emissions.

Project emissions, tCO_2 e 2010	
MU 'Vodokanal' water supply system	22519
MU 'Vodokanal' water disposal system	15359
Total	37878

Table 16. Baseline emissions .

Baseline emissions, tCO_2 e 2010	
MU 'Vodokanal' water supply system	88364
MU 'Vodokanal' water disposal system	44501
Total	132865

D.1.4. Leakages:

There are no leakages associated with this project.

D.1.5. Emission reductions as a result of project implementation in 2010:

Emission reductions as a result of project implementation are calculated as a difference between baseline and project emissions.

Table 17. Overall emission reductions.

Year	Emission reduction, tCO_2 e
2010	94987

Number of emissions reduction within the project year does not differ from values specified in PDD.

Annex 1 – Monitoring Plan parameters

Parameters number and name (according to Monitoring Plan)	**M^3_{wr}**
Measurement unit	thousand m3/year
Description	Recording of water supplied by MU 'Vodokanal' facilities during project year
Value for monitoring period	101654.10
Monitoring method	Flow meters installed at pumping stations enable recording of water supplied by MU 'Vodokanal' facilities
Recording frequency	Annually
Supporting documents	Report on water supply system operation (No.1-water water supply), developed based on monthly reports and daily dispatching records on domestic water.
Calculation method	Not used
Remarks	Detailed information on transported water amount is provided in Annex 2.

Parameters number and name (according to Monitoring Plan)	**M^3_{wb}**
Measurement unit	thousand m3/year
Description	Recording of water supplied by MU 'Vodokanal' facilities during baseline scenario
Value for monitoring period	122096.15
Monitoring method	Flow meters installed at pumping stations enable recording of water supplied by MU 'Vodokanal' facilities
Recording frequency	Annually
Supporting documents	Report on water supply system operation (No.1-water supply), developed based on monthly reports and daily dispatching records on domestic water.
Calculation method	Not used
Remarks	Detailed information on transported water amount is provided in Annex 2.

Parameters number and name (according to Monitoring Plan)	**kWh_{wr}**
Measurement unit	thousand kWh*hour (MWh*hour)
Description	Energy demand was measured at MU 'Vodokanal' pumping stations during project year
Value for monitoring period	18382.63
Monitoring method	Consumed electrical energy measuring by means of electrical meters
Recording frequency	Annually
Supporting documents	Report on water supply system operation (No.1- water supply)
Calculation method	N/A
Remarks	N/A

Parameters number and name (according to Monitoring Plan)	**kWh_{wb}**
Measurement unit	thousand kWh*hour (MWh*hour)
Description	Energy demand was measured at MU 'Vodokanal' pumping stations during baseline scenario
Value for monitoring period	88365.12
Monitoring method	Consumed electrical energy measuring by means of electrical meters
Recording frequency	Annually
Supporting documents	Report on water supply system operation (No.1- water supply)
Calculation method	N/A
Remarks	N/A

Parameters number and name (according to Monitoring Plan)	**M^3_{vr}**
Measurement unit	thousand m3/year
Description	MU 'Vodokanal' pumped sewage recording during project year
Value for monitoring period	55123.00
Monitoring method	MU 'Vodokanal' pumped sewage amounts are recorded via flow meters installed at sewage pumping stations
Recording frequency	Annually
Supporting documents	Report on sewer functioning (No.1-sewage), developed based on monthly reports and daily dispatching records on pumped sewage.
Calculation method	Not used
Remarks	Detailed information on pumped sewage amount is provided in Annex 2.

Parameters number and name (according to Monitoring Plan)	**M^3_{vb}**
Measurement unit	thousand m3/year
Description	MU 'Vodokanal' pumped sewage recording during baseline scenario
Value for monitoring period	55768.00
Monitoring method	MU 'Vodokanal' pumped sewage amounts are recorded via flow meters installed at sewage pumping stations
Recording frequency	Annually
Supporting documents	Report on sewer functioning (No.1-sewage), developed based on monthly reports and daily dispatching records on pumped sewage.
Calculation method	Not used
Remarks	Detailed information on pumped sewage amount is provided in Annex 2.

Parameters number and name (according to Monitoring Plan)	**kWh_{vr}**
Measurement unit	thousand kWh*hour (MWh*hour)

Description	Energy demand was measured at MU 'Vodokanal' sewage pumping stations during project year
Value for monitoring period	12537.90
Monitoring method	Consumed electrical energy measuring by means of electrical meters
Recording frequency	Annually
Supporting documents	Report on sewer functioning (No.1-sewage)
Calculation method	N/A
Remarks	N/A

Parameters number and name (according to Monitoring Plan)	**kWh_{vb}**
Measurement unit	thousand kWh*hour (MWh*hour)
Description	Energy demand was measured at MU 'Vodokanal' sewage pumping stations during baseline scenario
Value for monitoring period	31858.12
Monitoring method	Consumed electrical energy measuring by means of electrical meters
Recording frequency	Annually
Supporting documents	Report on sewer functioning (No.1-sewage)
Calculation method	N/A
Remarks	N/A

Parameters number and name (according to Monitoring Plan)	**$EF_{CO2,ELEC}$**
Measurement unit	tCO_2/MWh
Description	CO_2 Emission
Value for monitoring period	EF: (electric energy) = 1.225
Monitoring method	Normative document
Recording frequency	Once a year
Supporting documents	For electric energy Carbon dioxide emission factor for electricity consumption (EF) is used that is applicable to Ukraine in year 'y' as per regulation from the Ukrainian legislation, in particular Order of the National Agency of Ecological Investments of Ukraine 'On approval of indexes for carbon dioxide specific emissions' dated 2010.
Calculation method	Normative document
Remarks	N/A