JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
Version 01 - in effect as of: June 15, 2006

CONTENTS

SECTION A. General description of the project

A.1. Title of the project:

"Reconstruction of water supply and drainage system "Luganskvoda Ltd."

Sectoral Scopes:

3. Energy demand.

Date: 04/10/2010 .

Version of Project Document: 02.

A.2. Description of the project:

Purposes of project activity: The project's main goal is reduction of electric energy consumption by rehabilitation of centralized water-supply network in Lugansk region, which includes replacement and rehabilitation of pumps and water distribution systems, as well as installation of frequency regulators and optimization of the technological process of water pumping. Electric energy consumption reduction will result in decrease of greenhouse gas emissions (CO_2 and N_2O). The purpose of the project is sustainable development of the city through implementation of energy saving technologies.

Historical details of ""Luganskvoda Ltd."development.
Regional water and wastewater treatment plant was established in 1965 by Resolution of Lugansk Regional Council and included 5 city water treatment plants: Alchevskyy, Antratsit, Krasnyy Luch, Stakhanov and Lysychansk. In 1985 Regional water and wastewater treatment plant numbered already 22 city water treatment plants, including water treatment plant of Lugansk city (named as "Voroshylovgrad" at that time). In 1985 Lugansk Regional Council approved the resolution about establishment of Regional Production Enterprise (RPE) "Voroshylovgradvodokanal", one of the first enterprises in Ukraine.
On April 17, 2003 united Regional Utility Enterprise "Company "Luganskvoda" was established on the basis of "Voroshylovgrad" enterprise by the resolution of 7th session of 24th convocation of Lugansk Regional Council No. 7/26 within elaboration and implementation of the Program on improvement of water supply to settlements of Lugansk region.
On December 23, 2003 Regional Utility Enterprise "Company "Luganskvoda" (hereinafter referred to as RUE "Company "Luganskvoda") obtained the license No. 221941 for centralized water utilization and water discharge. Specialists of RUE "Company "Luganskvoda", with the assistance of Lugansk regional state administration and direct participation of the employees of State housing and communal services of Ukraine elaborated "Program of water-and-sewage networksreformation and development in Lugansk region for 2004-2006 with a view to development till 2010" approved by the decree of the Cabinet of Ministers of Ukraine dated July 13, 2004.
The program reflected the whole spectrum of issues as to reformation and development of water-and-sewage networksin the region. First of all, the program was aimed at stabilization of quality drinking water supply to the population, prevention of emergency sanitation and epidemiological situation and social tension in the region, as well as conducting of arrangements for decrease in net cost of water supply and water discharge

services. Due to lack of funds the program has not been implemented; its realization made it possible only to maintain the water-supply network in good running order and to perform current repair works. In January 2007 management of RUE "Company "Luganskvoda" made a decision to realize the joint implementation project at the enterprise. In January 2007 the Working team for implementation of arrangements aimed at updating of water-supply network in Lugansk city and Lugansk region was created. During 2007 the first rehabilitations within this project were performed.

In April 2008 RUE "Company "Luganskvoda" was reorganized into "Luganskvoda Ltd.".

The enterprise purchases the drinking quality water and supplies it to the consumer – population, companies, villages and cities of Lugansk region through the system of pipelines, pumping plants and water-distribution networks. Separate divisions of "Luganskvoda Ltd." have their own underground sources of water supply, capacity of which provides 80% of total water supply volume.

The following is on the books of the enterprise:

- Water-supply networks - 7353,6 km.
- Water-intake - 597 units.
- Water pumping plants - 170 units.
- Sewage networks-1750 km.
- Sewage pumping stations - 118 units.
- Sewage treatment plants - 56 units.

"Luganskvoda Ltd." is multi-faceted business. In addition to works related to lifting, treatment and supply of drinking water to consumers, taking, transportation and purification of waste waters and sludge, the enterprise performs the following services:

- Control of quality of the drinking water and waters of surface and underground sources;
- Control of stock of contaminants and purification of waste waters;
- Calculation of maximum permissible concentration of contaminants, discharged to sewage networksand natural basins;
- Consulting, expert-analytical, informational, scientific-research and marketing services;
- Installation of record keeping device;
- Mounting, repair and adjustment of chlorination and ventilation plants, air turbo-blower;
- Metrological services applying metrological meter device for research, testing, certification and calibration of flow meters and water meter;
- Detection of leakage in pipelines applying acoustic equipment.

Total number of enterprise's employed persons: 5425.

Description of conditions whereon the project will be implemented . Unsatisfactory technical state of water supply and drainage systems in Lugansk region, continuous wear of equipment and old technological schemes result in increase of water loss and ineffective consumption of electricity in the course of water transportation.

In case of absence of Joint Implementation (JI) Project volumes of water loss in water supply and drainage systems of "Luganskvoda Ltd." would increase as well as volume of consumed electric energy for transportation of water unit (due to moral depreciation of the equipment).

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

The project provides for GHG emission reduction due to:

- Replacement of energy-intensive pumps by new highly energy-efficient ones;
- Optimization of the technological process of water pumping;
- Introduction of automatic air valves on water mains for pressure decrease of pressure and improvement of discharge capacity;
- Replacement of water-supply networks;
- Installation of new groups of record keeping devices;
- Introduction of new devices for concealed leakage detection;
- Installation of frequency regulators.

Due to reduction of consumed electric energy applied by pumping stations from electrical gridof Ukraine, burning of fossil fuel for electric energy generation to the network will be decreased resulting in GHG emissions reduction.

This will be after the project implementation, when servicing in the sphere of water supply becomes more effective.

The project may promote sustainable development of "Luganskvoda Ltd." in the following aspects:

- Decrease of national economy's dependence on import of energy resources and increase of country's energy supply security
- Improvement of water supply quality;
- High rates of labor and health protection;
- Improvement of the global ecology state (counteraction in response to global climate change by means of reduction of carbon dioxide emission into the atmosphere;
- Resolution of the problem of continuous water supply to consumers

A.3. Project participants:

Party involved	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (YES/NO)
Ukraine (Host Party)	"Luganskvoda Ltd."	No
Switzerland	"VEMA S.A."	No

A.4. Technical description of the project:

A.4.1. Location of the project:

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

Figure 1. The map of Ukraine

A.4.1.1. Host Party(ies):

The project is located in Ukraine.

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

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

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

Climate of Lugansk region is moderately continental. Average temperature in summer is +21°C, and in winter - -7°C. Average annual amount of precipitations is 495-505 mm.

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

Lugansk city, town and villages of Lugansk region (Figure. 2)

Figure. 2. Map of Lugansk region

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

Majority of water-supply networks of territorial districts in Lugansk region are involved in the project.
By organization structure "Luganskvoda Ltd." is divided into 6 administrations and 13 departments. The list of separate subdivisions "Luganskvoda Ltd.":
The list of separate subdivisions of "Luganskvoda Ltd.":
1. Separate subdivision "Lugansk Administration" in the city of Lugansk
2. Separate subdivision "Southern Administration" in the city of Lugansk
3. Separate subdivision "Rovenkivskyy Department" in the town of Rovenky
4. Separate subdivision "Sverdlovskyy Department" in the town of Sverdlovsk
5. Separate subdivision "Alchevskyy Administration" in the town of Alchevsk
6. Separate subdivision "Slovyanoserbskyy Department" in urban settlement Slovyanoserbsk"
7. Separate subdivision "Perevalskyy Depatment" in the town of Perevalsk
8. Separate subdivision "Antratsyt Department" in the town of Antratsyt
9. Separate subdivision "Krasnoluchskyy Department" in the town of Krasnyy Luch
10. Separate subdivision "Department of ZFS operation" in Bilogorivka village
11. Separate subdivision "Svetlichanske Administration" in the town of Pervomaysk
12. Separate subdivision "Stakhanovskyy Department" in the town of Stakhanov
13. Separate subdivision "Kirovskyy Department" in the town of Kirovsk
14. Separate subdivision "Bryankivskyy Department" in the town of Bryanka
15. Separate subdivision "Popasnyanskyy Department" in the town of Popasne
16. Separate subdivision "Pervomayskyy Department" in the town of Pervomaysk
17. Separate subdivision "Starobilske Administration" in the town of Starobilsk
18. Separate subdivision "Melovskyy Department", urban settlement Melove, Druzhby Narodiv Street, 179.
19. Separate subdivision "Svatovskyy Department", town of Svatovo, Pershogo Travnya Street, 2

Note: 01/10/2006 Separate subdivision "Lutuginskyy Department" and separate subdivision "St. Lugansk Department" are united and included into separate subdivision "Southern Administration.
Separate subdivisions are not legal entities. Their managers act on the ground of the powers of attorney issued by the General Director of "Luganskvoda Ltd.". Management structure of subdivisions: General Director, first deputy of general director, CTO and chief accountant. Directors and heads of subdivisions are subordinated to the General Director of "Luganskvoda Ltd.".

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

Arrangements implemented in order to increase the efficiency of water supply to "Luganskvoda" LLC consist in the following:

1. Rehabilitation of pumping equipment.

"Luganskvoda Ltd." applies horizontal and submerged pumps. Submerged pump is the pump submerged below the level of pumped over fluid. This ensures deep water lifting, quality cooling of pump components and makes it possible to lift the water with dissolved gas. They are installed in wells and shaft wells. Horizontal pumps are aimed for pumping over of fresh water with the temperature of +100°C and are applied for water supplying of urban settlements and industrial companies. The project provides for replacement of stuffing boxes preventing water leakage from pumps, improvement of pump operation and cutting of pump rotor. Exit edge of rotor is grinded off along the length, thus increasing output area of rotor channels in a circumferential direction. Conducted experiments demonstrated that increase of output area by 11,7% made it possible to increase feed by 16,7% subject to the highest value of Efficiency Factor and invariable power and head. Replacement of shaft bushes improves efficiency of pumps' operation due to protection of shaft against the water effect.

2. Replacement of pumping equipment.

Old pumps with low efficiency of 50-60% will be replaced by the pumps with the efficiency of 81-89%. Technical characteristics of new pumps to be installed are stated in the Table 1, Table 2 and on manufacturers' sites[1].

Nominal size of pump unit	Parameters of pump			Parameters of electric motor			Sizes of pump unit, mm	Weight, kg
	Q, m^3/h	H, m	Positive suction head, m	Type	Nd, kWt	n, min^{-1}	L x B x H	
Centrifugal pump 400/105	400	105	3	5AH315A4	200	1450	2690x1215x1148	3080
Centrifugal pump 400/105	400	105	3	5AM315A4	200	1450	2690x1215x1148	3180
Centrifugal pump 400/105a	380	96	3	5AH280B4	160	1450	2485x1215x1148	2605
Centrifugal pump 400/105б	360	83	3	5AM280M4	132	1450	2445x1215x1148	2555
Centrifugal pump 400/210	400	210	3	6AH355B4	400	1450	3310x1370x1645	4700
Centrifugal pump 400/210	400	210	3	A4-355У4	400	1450	3710x1370x1645	5250

[1] http://www.aggregate.com.ua/pumps/pump_cn.htm

Centrifugal pump 400/210	400	210	3	ДАЗО-400Х4	400	1450	3710x1370x1645	5550
Centrifugal pump 400/210а	380	192	3	6А355М4	315	1450	3785x1370x1440	5225
Centrifugal pump 400/210б	360	166	3	6А355S4	250	1450	3725x1370x1440	4975
Centrifugal pump 1000/180	1000	180	3	А4-400У4	630	1450	3205x1475x1630	4130
Centrifugal pump 1000/180	1000	180	3	ДАЗО-450Х4	630	1450	3405x1475x1630	4730
Centrifugal pump 1000/180а	900	157	3	А4-400Х4	500	1450	3305x1475x1630	4530

Table 1. Pump units of centrifugal type with electric motors of general industrial application.

Figure 3. Pumping equipment. Centrifugal pump.

Type of pumping equipment	Characteristic of equipment is represented on manufacturer's site:
Pumping equipment Z22	http://www.absinternational.com/default.asp?sPage=%2Fru%2Fproducts%2Easp%3FiAreaID%3D1963%26iCategoryID%3D7%26iProductID%3D70&sAreaIDs=0,'Products'

Table 2. Pump units of Z22 type.

Figure 4. Pumping equipment Z22.

3. Optimization of the technological process of water pumping.

Optimization of the technological process of water pumping will be conducted, i.e. at some areas the water will be supplied directly to the consumers, passing the reservoirs. There will be transfer of load from pumping plants with old equipment to the pumping stations fitted with high-performance equipment.

4. Installation of automatic air valves.

Automatic air valves will be implemented for decrease in pressure of water mains and improvement of waterway capacity.

5. Replacement of water-supply networks.

Rehabilitation of the system of water-supply networks will make it possible to decrease loss of electric energy due to full use of water, change of pressure within the network enabling the pumps to operate in optimal regime.

6. Installation of new groups of record keeping devices.

New group of record keeping devices will be installed for ordering of control and accounting of water and electric energy consumption.

Type of device	Characteristic of equipment is represented on site:
Flow meter PT878 – 8 + D868M+CPL-2+CPL-3	http://www.pergam.com.ua/catalog_27.htm

Table 3. Characteristic of record keeping devices.

7. Installation of frequency regulators.

Installation of frequency regulation of electric motors of water supplying pumps will make it possible to decrease electric energy consumption significantly. Such regulators will enable to change power of electric motors depending on connected load both within twenty-four-hours of water supply change and within the year.

Type of frequency regulator	Characteristic of equipment is represented on site:
Delta . VFD EL	http://delta-electronics.su/index.php?page=how-cmsms-works

Delta . VED F	http://delta-electronics.su/index.php?page=how-cmsms-works
Delta VFD B	http://delta-electronics.su/index.php?page=how-cmsms-works

Table 4. Characteristic of frequency regulators.

Generalized schedule of such measures implementation is the following:

№	**Stage of project**	**PERIOD**
1	Rehabilitation of pumping equipment	10/2007-12/2011
2	Replacement of pumping equipment	10/2007 – 06/2011
3	Optimization of the technological process of water pumping	05/2007 – 12/2011
4	Installation of automatic air valves	07/2007-12/2011
5	Replacement of water-supply networks	11/2007 – 06/2011
6	Installation of new groups of record keeping devices	11/2007 – 12/2011
7	Installation of frequency regulators	10/2007 – 12/2011

Table 5. Schedule of project implementation

Results which will be obtained after implementation of such technologies and arrangements are given in Accompanying documents 1, 2.
31.12.2011 is the final date of project arrangements implementation.

"Luganskvoda Ltd." makes annual calculations of water leakage within the network. Based on such calculations, it determines planned replacements. If the water losses at site don't exceed standard water loss, the company is not obliged to make planned replacement of the pipeline. Pipelines to be repklaced as a result of project implementation are not the part of technological maintenance (emergency situations, planned replacements). Pipeline replacement is conducted at sites, which don't exceed planned water loss yet, but are in poor condition.
Technologies to be realized by the project are already proven and state-of-the-art in the sphere of water supply and water discharge. They will result into significantly better productivity. Taking into consideration general economic circumstances, reliability of replacement of technologies proposed in the project by the more effective technologies is too low in the nearest 20-30 years.
As concerns the first period of commitments of 2008-2012, there are no risks that replacement of technologies proposed in the project by the more effective technologies is possible within this year.
Since the principal activities of "Luganskvoda Ltd." don't change when introducing the Joint Implementation (JI) project, special trainings for personnel are not necessary. Technical personal of the enterprise possesses necessary knowledge and experience for execution of project activities and repair of common equipment provided for by the project.

In case of new equipment application (such equipment which has not been used by this enterprise before), the manufacturing company shall conduct trainings for personnel.
New equipment to be installed doesn't require special maintenance. Personnel of "Luganskvoda Ltd." will maintenance new equipment in operating mode (exploitation, planned repair) within the period of project implementation and after the project period.

"Luganskvoda Ltd." retrains the personnel according to the requirements of Norms of labour protection. The enterprise has the Labour Protection Department responsible for professional development and trainings of the personnel.

In the course of elaboration of JI project the specialists of VEMA S.A. carried out broadened consultations for involved representatives of Commercial Utility Enterprise "Donetskmiskteplomerezha" about collection of necessary data according to the Monitoring plan of the project.

In September-October 2009 the company "The International Benchmarking Network for Water and Sanitation Utilities" conducted training course "Control of water loss and leakages" according to the methodology of World Bank Institute.

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

Project activity, which includes rehabilitation of pumps, water distribution networks and installation of frequency regulator swill make it possible to increase power efficiency of water-supply network in Lugansk region to such extent that it will supply the same quantity of water consuming at the same time less quantity of electric energy. Saving of traditional carbon organic fuel at power plants will result in reduction of the CO_2 emissions of state electrical grid.

In absence of the proposed project all equipment, including the old ineffective but operable equipment, will work in the usual mode for a long time, and no emission reduction will take place. According to the Ukrainian Law "On drinking water and drinking water supply"[12] business activity in the sphere of drinking water supply to the consumers shall be licensed. There are no legislative document committing the water supplying company "Luganskvoda Ltd." to modernize pumping equipment and water-distrubtion networks.

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

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

	Years
Length of the crediting period	5
Year	Estimated annual emission reductions in tonnes of CO_2 equivalent
2008	96676
2009	141004
2010	151561
2011	151561
2012	151561
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	692363
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	138473

Table 6. Estimated amount of emission reductions during the first commitment period.

	Years
Length of the crediting period	15
Years	Estimated annual emission reductions in tonnes of CO_2 equivalent

[2] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=2918-14

2013	151561
2014	151561
2015	151561
2016	151561
2017	151561
2018	151561
2019	151561
2020	151561
2021	151561
2022	151561
2023	151561
2024	151561
2025	151561
2026	151561
2027	151561
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	2273415
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	151561

Table 7. Estimated amount of emission reductions after the first commitment period.

More detailed information is provided in the Accompanying Document 3.

Description of formulaes used for preliminary estimation of emission reductions is represented in Section E.

A.5. Project approval by the Parties involved:

August 2010 – National Environmental Investment Agency of Ukraine issued the Letter of Endorsement (No. 1221/23/7 as of 18.08.2010) for this JI project.

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

SECTION B. Baseline

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

The project activity refers to the "Energy demand" category. Current activities of "Luganskvoda Ltd." is characterized by continuous worsening of water-supply network and large ineffective consumption of electric energy. The reason of such state is lack of the funds for building and implementation of new technologies.
Project activity is aimed at decrease in GHG emission reduction in state electrical gridas a result of modernization of water-supply network in Lugansk region, replacement of old pumping units by new modern ones, replacement of water distribution networks and introduction of new technologies of water supply.

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

- AM0020 "Baseline methodology for water pumping efficiency improvements"[3], Version 02 ("Baseline methodology for water pumping efficiency improvements ").

It is impossible to apply Methodology AM0020 since the formulaes for preliminary estimation of project emission reductions include exact values of electric energy consumption and volumes of water supplied to the system. In our case it is impossible to state necessary quantity of electric energy for water pumping to the consumer in project year. Specific approach based on efficiency factor of pumping equipment and water leakage within the water supply network is applied to improve accuracy of preliminary calculations.

Applied AM0020 (version 02)	Project activities
This methodology may be applied for the projects, which:	
(a) try to reduce GHG emission due to reduction of energy quantity necessary for water supply to end users in municipal water and wastewater treatment plants.	(a) project activities provide for decrease in electric energy consumption, necessary for water supply to end users in municipal water and wastewater treatment plants.
(b) increase efficiency of energy consumption in the system of water pumping, including decrease in technical loss and leakage of water, as well as energy efficiency of pump schemes consuming electric energy from electrical supply networks, where is:	(b) project activities provide for increase in efficiency of energy consumption in the system of water pumping, including decrease in technical loss and leakage of water, as well as energy efficiency of pump schemes consuming electric energy from electrical grid, where:
(1) increase in efficiency (energy and water) of already existing schemes of water supply	(1) project activity provides for increase in efficiency (energy and water) of already existing schemes of water supply.

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

(2) elaboration of new schemes replacing old one, which will not be used anymore. This method will apply to new scheme only for measurement of capacity (annual volime of supplied water) of old scheme.	
(e) this methodology can not be applied for project activities in cases of development of absolutely new schemes for increase in available potential. Only emission reductions up to existing potential of the system will be considered.	(e) project activity provide for increase in efficiency (energy and water) of already existing schemes of water supply.
(f) this methodology shall be applied in combination with the approved monitoring methodology AM0020 ("Methodology for water pumping efficiency improvements"[4]).	(f) Specific approach elaborated for this project applies monitoring methodology AM0020 ("Methodology for water pumping efficiency improvements").

Table 8. Application of methodology AM0020 (version 02).

Baseline study will be executed for each year, when sale of emission reduction takes place, for adjustment of water supplied by water distribution networks influencing on baseline. Detailed information is given in Section D. 1.

There were three different versions of Baseline scenario, which have been discussed before this project start.

The first version of Baseline scenario was “business as usual” – the scenario providing for implementation of minimal repair against the background of total degradation of the water-supply network.

There are no barriers for implementation of this Baseline scenario (there are no investment barriers since this scenario doesn’t require involvement of additional investments; there are no technological barriers, since this equipment is operated by skilled personnel and there is no need to conduct additional retraining). This scenario reflects customary practice in Ukraine.

The second version of Baseline scenario provides for rehabilitation without Joint Implementation mechanism. In such case both barriers exist: investment (since this scenario requires additional considerable investments and has too long payback period and high risks, therefore it is not investment-attractive) and technological barrier (since application of new up-to-date equipment requires additional retraining of the personnel). Equipment rehabilitation for efficiency increase is not customary practice in Ukraine.

Third version of Baseline scenario is exclusion of any non-key arrangements from project, for example, exclusion of frequency regulation implementation from the projects, etc. However it was concluded that it would make the project less economically attractive and would extend the period of project’s payback.

Thus the first version was selected for Baseline scenario.

Status and correspondence of current water-supply network

Current operation of water-supply network in Lugansk region is based on pumping equipment of Ukrainian or Russian manufacturing, including: VNS - 14, 10NMK*2, TSN 400/210, SM 250/200/400, D 1250-125, D 630-125, ATN14-1-4, ETSV 10-63-110, TSN 1000x180, and some other types. Detailed information is given in Accompanying document 1 (Pumps). Current efficiency of these pumps is 50-60%.

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

There are two types of water leakage at «Luganskvoda Ltd.»: productive and nonproductive; real practice of water-supply network exploitation in Ukraine. Such losses include own needs of water supply company (water loss for preventive maintenance of water supply networks, disinfection and washing of technological constructions and leakage therefrom, etc.). The main component of water loss is water leakage from water supply network. The company is obligef to make annually theoretical (calculation in accordance with the "Methodology of branch technological standards of drinking water use at the companies of water supply and drainage industry of Ukraine"[5]) and actual calculation of water loss from water-supply network. Results of calculations in reporting form[36] shall be submitted to the State committee of water industry of Ukraine"[47]. Available distribution networks of "Luganskvoda Ltd." are characterized by averaged losses from 40 to 50%.

Detailed information about leakages is given in Accompanying document 2 (Networks).

Baseline scenario formation

Current operation of water-supply network in Lugansk region is represented in failure of operation of pumping and water distribution equipment with its continuous degradation. However at the same time prompt repair increases efficiency, compensating worsening to large extent and equalizes the level of annual total emissions (baseline) during the years.

Level of activities is represented by annual electric energy consumption. Project installation of new equipment and rehabilitation of old one was conducted at the end of 2007. With a view to conservatism reductions due to such project implementations are not taken into consideration; 2007 year was taken for calculation of Baseline. Consumption of electric energy in basic year is given in the Table 9.

"Luganskvoda Ltd."	Basic consumption of electric energy, t. kWh
Pumping plants of "Luganskvoda Ltd."	449933

Table 9. Basic consumption of electric energy

Detailed information is given in Accompanying document 3.

GHG emissions involved in baseline scenario:

CO_2 emissions from electric energy production to state electrical grid.

Ukraine has united electrical supply network, therefore average value of Carbon Emission Factor (CEF) is applied for electric power generation.

Carbon Emission Factors (CEF) for 2006-2012 were taken from «Emission Factors for Ukrainian electrical grid» from the document «Ukraine – estimation of new CEF calculation», verified by TUV SUD Industrie Service GmbH on 17.08.2007 [8].

If other carbon emission factors will be taken for Ukrainian electrical supply networks, the baseline shall be recalculated for any reporting year according to the monitoring plan.

[5] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=z1557-04%20

[6] Звітний Документ Форма 2 ТП Водхоз.

[7] http://www.sdbuvr.slav.dn.ua/RU/about.htm

[8] http://www.neia.gov.ua/nature/doccatalog/document?id=116936

Calculation of total annual baseline carbon emissions, which would occur during the baseline year if the water-supply network in Lugansk region remains unchanged, are given in accompanying document 1 (Baseline). They consist of accurate amount of total CO_2 emissions, which occured during basic year 2007, and additional emissions, which will be decreased after energy-saving measures implementation.

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

Data/Parameter	**EF**
Data unit	t CO_2/ t. kWh
Description	Carbon emission factor for Ukrainian electrical grid
Time of determination/monitoring	Once, at the beginning of the project
Source of data (to be) used	Research data of Global Carbon B.V.[9]
Value of data applied (for ex ante calculations/determinations)	0,896
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	N/A
Any comment	Researches don't take into consideration production of energy by nuclear power plants

Data/Parameter	**M^3_b**
Data unit	m^3
Description	Total volume of water supplied to the consumers during the basic year
Time of determination/monitoring	Determined before the beginning of the project in basic year 2007
Source of data (to be) used	Data of flow meters installed in lifting stations
Value of data applied (for ex ante calculations/determinations)	204902000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0020 (version 02)
QA/QC procedures (to be) Applied	Measurements are performed by regularly calibrated meters .
Any comment	Data allowing calculation of GHG emissions in basic year ; information will be archived in paper and electronic form

Data/Parameter	**kWh_b**
Data unit	kWt* h
Description	Total amount of electric energy necessary for water transportation to

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

	consumers during basic year
Time of determination/monitoring	Determined before the beginning of the project in basic year 2007
Source of data (to be) used	Data of electricity supply meters installed at pumping stations
Value of data applied (for ex ante calculations/determinations)	449933000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0020 (version 02)
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters .
Any comment	Data allowing calculation of GHG emissions in basic year ; information will be archived in paper and electronic form

Data/Parameter	$\mathbf{M^3_{i,r}}$
Data unit	m^3
Description	Volume of water supplied to consumers in "i" water-supply network during project year
Time of determination/monitoring	Daily
Source of data (to be) used	Data of flow meters installed in lifting stations
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0020 (version 02)
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters .
Any comment	Data allowing calculation of GHG emissions in basic year ; information will be archived in paper and electronic form

B.2. Description of how the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the JI project:

Anthropogenic emissions of greenhouse gases in project scenario will be decreased due to complex modernization of pumping and water-distribution equipment by introduction of technologies proposed in project activity and described above, which include replacement of old pumps by new higher effective pumps, frequency regulators installation and rehabilitation of old water-distribution systems.

Additionality of the project

The additionality of the project activity is demonstrated and assessed with using the "Tool for the demonstration and assessment of additionality" [10] (Version 05.2). This manual was elaborated in original for CDM projects, but it may be also applied for JI projects. This tool was applied according to the operating instructions proposed in partially similar methodology "Methodology of baseline and monitoring AM0020".

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

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

Sub-step 1a: Define alternatives to the project activity:

There are three alternative variants of this project (which has been already discussed in Section B.1).

Variant 1: The first alternative is continuation of existing situation (there is no project activity or other alternatives), i.e. scenario "business as usual" with implementation of minimal repair works against the background of total degradation of water-supply network.

It should be noted that there is no local legislation in relation to the period of pumps' replacement and their maximal period of operation. Customary practice is exploitation of pumps installed in the seventies and even sixties-fifties and earlier, if they underwent technical examination of the authorized body (State Inspectorate of Labor Protection).

Variant 2: The second alternative is rehabilitation (proposed project activity) without application of Joint Implementation mechanism.

Variant 3: Third alternative is reduction of project activity, exclusion of any non-key arrangements from project, for example, exclusion of frequency regulation implementation from the project, etc.

Outcome of Step 1a: Three realistic alternative scenarios to the project activity are identified.

Sub-step 1b: Consistency with mandatory laws and regulations:

Variant 1: According to the Ukrainian Law "On drinking water and drinking water supply"[11] supply of drinking water to consumers shall be licensed. There are no any legislative documents binding the enterprise "Luganskvoda Ltd." to modernize pumping equipment and water-distribution networks. In accordance with the law "On drinking water and drinking water supply"[12] the enterprise is obliged only to maintain the system in good running order and prevent accidents. Current practice of water leakage detection and elimination corresponds to all current laws and standards of Ukraine. Legislation admits water loss. Standards establish only periodicity of calculations of water loss from water-distribution networks to be made by the water-distribution organizations. "Luganskvoda Ltd."'s practice of water loss detection corresponds to stated standards. Control of adherence to the standards is executed by calculation of water loss of distribution systems once per 10 years.
The project also conforms to existing regulatory requirements in Ukraine concerning detection of water loss at water-distribution networks, and to any other current applicable legislative norms.
Variant 2: Rehabilitation without JI mechanisms application shall be consistent with statutory laws and decrees; detailed information about analysis of comformity with the legislation was elaborated for Variant 1, similar to the conformity with statutory laws and decrees of Variant 2.
Variant 3: Rehabilitation without JI mechanisms application and exclusion of any non-key arrangements from the project shall be consistent with statutory laws and decrees; detailed information about analysis of comformity with the legislation was elaborated for Variant 1, similar to the conformity with statutory laws and decrees of Variant 2.

Outcome of Step 1b: Under such conditions one may say that all scenarios don't contradict wity current laws and regulatory acts.

Hence, the Step 1 is satisfied.

Step 2. Investment analysis.

[11] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=2918-14

[12] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=2918-14

Sub-step 2a: Determine appropriate analysis method

According to the art. 191 of the Civil Code of Ukraine state (communal) fixed prices shall be established for products (services) of great social importance for population and manufactured by business entities-monopolists. In this connection "Luganskvoda Ltd." is not entitled to establish the prices (rates) for rendered services by itself: water supply and drainage. According to the art. 28 of Ukrainian Law "On local self-government in Ukraine" executive committees of village, urban and city councils are entitled to establish the rates of personal, communal, transport and other services, including water supply and drainage services. At present "Luganskvoda Ltd." establishes prices of water supply and drainage services, which shall be approved (agreed) afterwards in case of absence of any objections on the part of executive committees.

In connection with applicable Procedure of setting prices for water supply and drainage[13], reduction of expenses as to electric energy for water supply will not bring in return to the enterprise, since according to this Procedure reduction of expenses for electric energy results in decrease of prices for end consumers. Thus the enterprise doesn't obtain additional revenue, and reduction of expenses for electric energy results in decrease of enterprise's revenue due to rate reduction.
The following steps have been done according to the additionality tools of the CDM Executive Committee "Tool for the demonstration and assessment of additionality[14]" (revision 05.2).

Sub-step 2b: Option I. Apply simple cost analysis

Project implementation will require costs in addition to existing costs for rehabilitation of water-supply network in Lugansk region. Additional costs of Project implementation include the costs of: purchase of new pumping equipment, rehabilitation of existing pumps, installation of new frequency regulators, purchase of pipes, personnel training, maintenance control, systematic data collection, etc. Expenses as to implementation and realization of the project "Reconstruction of water supply and drainage system "Luganskvoda Ltd." consist of:

- Expenses for materials for pumps rehabilitation (stuffing boxes, shaft, rotor), 1050954 Euro;
- Cost of pump replacement works, 613540 Euro;
- Consulting, personnel training, other actions, 406000 Euro;
- Other expenses, 102000 Euro.
  In total 2172494 Euro will be spent for the project.

Equipment used in this project is the best in the context of Efficiency Factor, quality of execution and applied technical solutions among the materials and equipment available on Ukrainian market. Important parameter of equipment selection was availability of spare parts in Ukraine.

As a result of current practice all losses of electric energy shall be borne by end consumers, and "Luganskvoda Ltd." has not incentive to introduce power efficient equipment.

At the moment of project's beginning pumping stations of "Luganskvoda Ltd." use old pumping equipment manufactured in the USSR.
Application of Kyoto mechanisms to this project makes these measures economically efficient and is the only way for their implementation.
As emission reduction does not bring any economic benefit to "Luganskvoda Ltd.", except for the benefit formed under the Joint Implementation Project (JIP), we can make a conclusion that Project implementation without receiving proceeds under JI project causes obstacles for investments.

[13] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=959-2006-%EF

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

Outcome of Step 2: In connection therewith it is obvious that this project is economically unattractive without registration of the project as JI project, which proves additionality of this project.

Therefore Step 2 is satisfied.
Step 3: Barrier analysis

Sub-step 3a: Identify barriers that would prevent the implementation of the proposed CDM project activity:

Investment barriers

Additional expenses on the project realization include the costs of:

Rehabilitation of current pumping equipment;
Purchase and introduction of new pumping equipment;
Purchase and introduction of frequency regulators;
Purchase and replacement of water-supply networks;
Installation of new group of record keeping devices.
Introduction of new devices for concealed leakage detection

Financial barriers are connected with the structure of existing rates for water supply and drainage regulated by the state, and don't include depreciation and investment needs of water suppliers. Such situation leads to permanent lack of funds and impossibility of timely performance of capital repair, ensuring of equipment operation, investment into modernization and development of water-supply infrastructure.

Technological barriers

1. Due to financial problems recently the repair works were not conducted to the full extent and provided for mainly maintenance of the equipment, often without taking into consideration saving results. At the same time many junctions of the equipment are to be replaced. Implementation of Z22 pumps is unique technology for Ukrainyю With a view to complexity of such technology the qualification of pump maintenance personnel may be insufficient. In order to overcome such obstacle training of such employees is necessary.

Organizational barriers

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

Outcome of Step 3a: Identified barriers would prevent from implementation of the proposed project activity as well as of the other alternatives - rehabilitation without JI mechanisms and reduction of project activities subject to exclusion of any non-key measures from the project.

Sub-step 3 b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

One of the alternatives is continuation of "business as usual". Since the barriers identified above directly relate to investment into modernization of water supply and drainage system in Lugansk region, "Luganskvoda Ltd." doesn't have any obstacles for subsequent exploitation of water supply and drainage system at previous level.

Outcome of Step 3b: Identified barriers can not impede introduction of at least one alternative scenario – continuation of «business as usual».
Therefore Step 3 is satisfied.

Step 4: Common practice analysis

Sub-step 4a. Analysis of other alternatives similar to proposed project activities

Analysis of project activity similarity demonstrated absence of similar projects in Ukraine.
Absence of financial incentives, described for Step 2 and barriers of Step 3, concern not only "Luganskvoda Ltd.", but also other companies operating water-distribution networks in Ukraine. In this respect existing practice of equipment maintenance represented in the variant of basic conditions chosen for this Project is customary for Ukraine. Due to current practice all losses of electric energy shall be bourne by end consumers; and the companies engaged in water supply don't have incentives for energy effective projects implementation.
As a whole the same pumping equipment and water-distribution networks are used in Ukraine as in Lugansk region.
Outcome of Step 4a: Since there are no similar projects in Ukraine, there is no need to analyze similar project activity.

Conclusion

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

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

Geographical boundaries of the project coincide with territory of Lugansk region. "Luganskvoda Ltd." is divided into 19 administrations and departments. The whole water-supply network of "Luganskvoda Ltd." is involved into the project, but the water drainage system is not included into the project.

Sources of greenhouse gases and boundaries of the project:

Project's bounds for baseline scenario are represented in black rectangle on graphic figure (Figure 5)

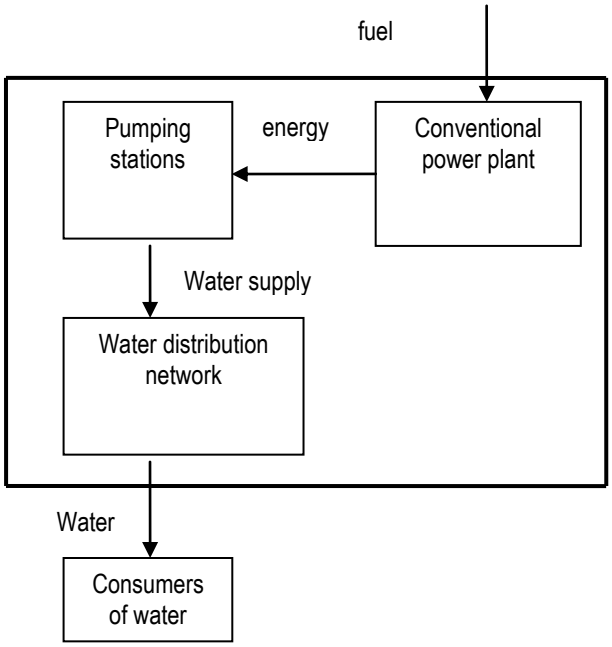


Figure 5. Scheme of the project's boundaries for baseline scenario.

Project's bounds for project scenario are represented in black rectangle on graphic figure (Figure 6)

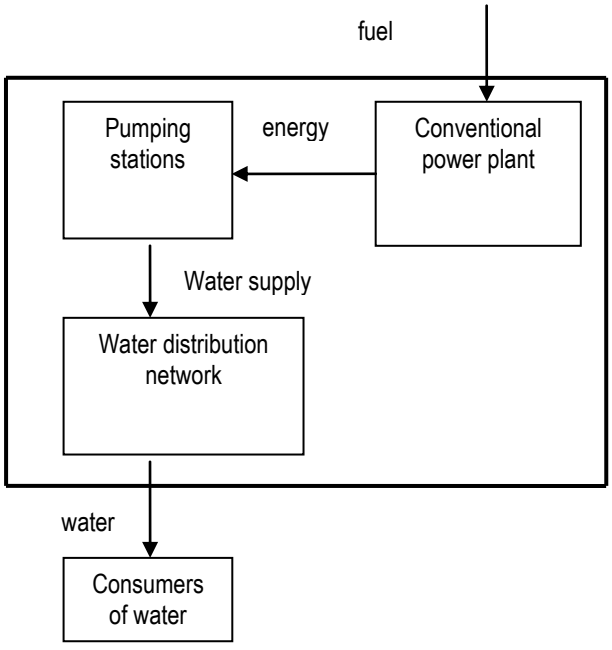


Figure.6. Scheme of the project's boundaries for project scenario.

Project's bounds for baseline scenario include CO_2 emissions related to electric energy production and electrical grid as a whole in the amount consumed by the pumps for water transfer, wherein energy-saving measures will be introduced.

Table demonstrates review of all sources of emissions under the baseline and project scenarios.

Scenario	Source of emissions	Emissions	Inluded or excluded	Explanations
Local emissions				
Baseline	Emissions from power plants when generating electric energy for state electricity grid	CO_2	Included	Main source of emissions
		CH_4	Excluded	Is not included for reasons of simplification. Analysis is conservative
		N_2O	Excluded	Is not included for reasons of simplification. Analysis is conservative
		NO_x	Excluded	NOx is not the greenhouse gas of direct effect
		CO	Excluded	CO is not the greenhouse gas of direct effect
Project	Emissions from power plants when generating electric energy for state electricity supply network	CO_2	Included	Main source of emissions
		CH_4	Excluded	Is not included for reasons of simplification. Analysis is conservative
		N_2O	Excluded	Is not included for reasons of simplification. Analysis is conservative
		NO_x	Excluded	NOx is not the greenhouse gas of direct effect
		CO	Excluded	CO is not the greenhouse gas of direct effect

Table 10. Sources of emissions included into and excluded from the project bounds

Indirect extraneous leakage of CO_2 , CH_4, N_2O from fuel production and its transportation are excluded. Leakages are not controlled by the project's developer (it is impossible to estimate quantity of leakages), due to this they were not excluded.

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

Date of baseline determination: 30/09/2010
Baseline is determined by the VEMA S.A., project's developer, and "Luganskvoda Ltd." (RUE "Luganskvoda"), owner of the project.

VEMA S.A.:
Kyiv, Ukraine.
Fabian Knodel,
Director.
Telephone: (+38 044 206 84 43)
Fax: (+38 044 206 84 43)
e-mail: Info-vema@gmail.com
VEMA S.A. is the project participant.

«Luganskvoda Ltd.»:
Lugansk, Ukraine

Maslak Viktor Mykolayovych
General Director.
Telephone: (+38 050) 328 75 89
Fax: (+38 0642) 34 14 03
e-mail: energo@klv.lg.ua
«Luganskvoda Ltd.» is the project participant.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Start of project activity: 22/01/2007
22/01/2007 - management of RUE "Company "Luganskvoda" made a decision to realize the joint implementation project.
29/01/2007 - Working team for implementation of arrangements aimed at updating of water-supply network in Lugansk region was created.

C.2. Expected operational lifetime of the project:

Minimum – 20 years/240 months (nominal operational lifetime of new equipment for pumping plants and water-distribution networks). Real average life-cycle of new equipment for pumps and water-distribution networks shall be about 30-40 years and is confirmed by the equipment certificates.Thus expected life-cycle of project shall be over 30 years. Following the principle of conservatism, we will take the life-cycle and corresponding crediting period for further calculations equal to 20 years/240 months (2008-2027).

C.3. Length of the crediting period:

JI project relates to the first period of commitments and is 5 years/60 months (January 01, 2008 – December 31, 2012).
Starting date of the crediting period was the expected date of first generated ERUs, namely: January 01, 2008. The end date of the crediting period is December 31, 2012. Therefore, length of the crediting period will make 5 years/60 months. If after the first period of commitments under Kyoto Protocol its validity is prolonged, crediting period under the project will be prolonged by 15 years/180 months (January 01, 2013-December 31, 2027). Taking into account the period preceding the crediting period, the crediting period and the period after its expiration, the total crediting period will make 20 years/240 months.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

Indicator of project's implementation
The most objective and cumulative factor demonstrating whether the emissions reduction occurred actually, is electric energy saving. It may be determined as the difference between basic consumption of electric energy and electric energy consumption after project's implementation. If pumps consume electric energy on project level, then all other indicators, such as efficiency of new pumps' operation, water loss at water-distribution networks, shall be corresponding.

Verification of the indicators of project's implementation
"Luganskvoda Ltd." collects and keeps the data relating to electric energy and acquired water for water-supply in the forms of electric energy and acquired water bills. Information about saved electric energy and acquired water will be attached to the monitoring reports with all corresponding documents and historical information about electric energy and water purchase by the Supplier.

Verification of emission reduction units and baseline scenario
Monitoring plan for this project was elaborated with specific approach using methodology AM0020.

Quantity of emission reduction units (ERUs), t CO_2e:

$$ER = E^b - E^r \quad (1)$$

where:
E^b and E^r –GHG emissions as a result of electric energy consumption for water supply, in basic and reporting years correspondingly, t CO_2e;

$[_b]$ index – relates to basic year;
$[_r]$ index – relates to reporting year.

$$E^b = M^3_r * PPER * EF, \quad (2)$$
$$E^r = kWh_r * EF, \quad (3)$$

where:

PPER- pre-project efficiency rate, kWh/m^3;

EF_r- carbon emission factor for Ukraine in "y" year, taken from «Study "Standardized emission factors for the Ukrainian electricity grid" (Version 5, 02 February 2007) developed by Global Carbon B.V.»;

kWh_r – total quantity of electric energy, necessary for water transportation to the consumers in project year, kWh;
M^3_r – total amount of water supplied to the consumers in project year, m^3.

[$_b$] index – relates to basic year;
[$_r$] index – relates to reporting year.

$PPER = kWh_b / M^3_b$ (4)
kWh_b- total quantity of electric energy necessary for water transportation to the consumers in basic year, kWh;
M^3_b- total amount of water supplied to the consumers in basic year, m;

[$_b$] index – relates to basic year.

$kWh_r = \sum kWh_{r,i}$ (5)
$kWh_{b,i}$- quantity of electric energy, necessary for water transportation to the consumers in system "i" in project year, kWh;

[$_i$] index – independent water-supply network[9];
[$_b$] index – relates to basic year.

$M^3_r = \sum M^3_{i,r}$ (6)
$M^3_{i,b}$- amount of water supplied to consumers in the water-supply network "i" in project year, m^3;

[$_i$] index – independent water-supply network;
[$_b$] index – relates to basic year.

Data and parameters uncontrolled during the whole period of crediting shall be determined only once, when they are available at the stage of PDD elaboration: total volume of water supplied to the consumers in basic year, m^3 (M^3_b), total quantity of electric energy necessary for water transportation to the consumers in basic year (kWh_r), carbon emission factors for Ukraine in "y" year are taken from «Study "Standardized emission factors for the Ukrainian electricity grid" (Version 5, 02 February 2007) developed by Global Carbon B.V.» (EF).

Data and parameters uncontrolled during the whole period of crediting shall be determined only once, when they are available at the stage of PDD elaboration: absent.

Data and parameters controlled during the whole period of crediting: volume of water supplied to the consumers in "i" water-supply network in project year, m^3 ($M^3_{i,r}$), quantity of electric energy necessary for water transportation to the consumers in "i" water-supply network in project year, kWh, ($kWh_{r,i}$).

Table of parameters which will be included into the process of monitoring and verification of ERUs calculation and stated in Section D.1.1.1 and D.1.1.3

D.1.1. Варіант 1 – Моніторинг викидів у проектному сценарії та базовому сценарії:

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:

Data/Parameter	**EF**
Data unit	tCO_2e/MWh
Description	Carbom emission factor for Ukrainian electricity supply network
Time of determination/monitoring	Once, at the beginning of the project
Source of data (to be) used	Research data of Global Carbon B.V.[15]
Value of data applied (for ex ante calculations/determinations)	0,896
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	N/A
Any comment	Researches don't take into consideration production of energy by nuclear power plants

Data/Parameter	**$M^3_{i,r}$ M-1**
Data unit	m^3
Description	Total volume of water supplied to the consumers in "i" water-supply network during the project year
Time of determination/monitoring	Daily

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

Source of data (to be) used	Data of flow meters installed in lifting stations
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0020 (version 02)
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters
Any comment	Data allowing calculation of GHG emissions in basic year ; information will be archived in paper and electronic form

Data/Parameter	**$kWh_{r,i}$ M-2**
Data unit	kWh
Description	Amount of electric energy necessary for water transportation to consumers in “i" water suppoy system during project year
Time of determination/monitoring	Monthly
Source of data (to be) used	Data of electricity supply meters installed at pumping stations
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0020 (version 02)
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters.
Any comment	Data allowing calculation of GHG emissions in basic year ; information will be archived in paper and electronic form

According to the effective laws, all metering devices in Ukraine shall meet satisfy the established norms and standards and shall pass regular inspections (as a rule once per year and for certain equipment – once per 2 or 3 years).

In case of metering devices' damage they shall be replaced or repaired as soon as possible. Such cases will be stated in monitoring reports.

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

$E^r = kWh_r * EF,$ (7)

E^r – CO_2 emissions as a result of electric energy consumption for water supply, in project year, t CO_2e;

where:

EF- carbon emission factor for Ukraine in "y" year, taken from «Study "Standardized emission factors for the Ukrainian electricity grid" (Version 5, 02 February 2007) developed by Global Carbon B.V.»;
kWh_r - total quantity of electric energy, necessary for water transportation to the consumers in project year, kWh;

[$_r$] index – relates to reporting year.

$kWh_r = \sum kWh_{r,i}$ (8)
$kWh_{r,i}$ - quantity of electric energy, necessary for water transportation to the consumers in water-supply network "i" in project year, kWh;

[$_i$] index – independent water-supply network;
[$_r$] index – relates to basic year.

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:

Data/Parameter	**EF**
Data unit	t CO_2/MWh
Description	Carbon emission factor for Ukrainian electrical grid
Time of determination/monitoring	Once, at the beginning of the project
Source of data (to be) used	Research data of Global Carbon B.V.[16]
Value of data applied (for ex ante	0,896

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

calculations/determinations)	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	N/A
Any comment	Researches don't take into consideration production of energy by nuclear power plants

Data/Parameter	**M^3_b**
Data unit	m^3
Description	Total volume of water supplied to the consumers during the basic year
Time of determination/monitoring	Determined before the beginning of the project in basic year 2007.
Source of data (to be) used	Data of flow meters installed in lifting stations
Value of data applied (for ex ante calculations/determinations)	204902000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0020 (version 02)
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters.
Any comment	Data allowing calculation of GHG emissions in basic year; information will be archived in paper and electronic form

Data/Parameter	**kWh_b**
Data unit	kWh
Description	Total amount of electric energy necessary for water transportation to consumers during basic year, kWh
Time of	Determined before the beginning of the project in basic year 2007.

determination/monitoring	
Source of data (to be) used	Data of electricity supply meters installed at pumping stations
Value of data applied (for ex ante calculations/determinations)	449933000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0020 (version 02)
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters.
Any comment	Data allowing calculation of GHG emissions in basic year; information will be archived in paper and electronic form

Data/Parameter	$\mathbf{M^3_{i,r}}$
Data unit	m^3
Description	Volume of water supplied to consumers in “i" water-supply network during project year
Time of determination/monitoring	Daily
Source of data (to be) used	Data of flow meters installed in lifting stations
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0020 (version 02)
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters.
Any comment	Data allowing calculation of GHG emissions in basic year ; information will be archived in paper and electronic form

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

$E^b = M^3_r * PPER * EF,$ (9)

where:

PPER- pre-project efficiency rate, kWh/m^3;

EF- carbon emission factor for Ukraine in "y" year, taken from «Study "Standardized emission factors for the Ukrainian electricity grid" (Version 5, 02 February 2007) developed by Global Carbon B.V

M^3_r - total amount of water supplied to the consumers in project year, m^3.

$[_b]$ index – relates to basic year;
$[_r]$ index – relates to reporting year.

$PPER = kWh_b / M^3_b$ (10)

kWh_b- total quantity of electric energy, necessary for water transportation to the consumers in basic year, kWh;
M^3_b- total amount of water supplied to the consumers in basic year, m^3;

$[_b]$ index – relates to basic year.

$M^3_r = \sum M^3_{i,r}$ (11)

$M^3_{i,r}$- amount of water supplied to consumers in the water-supply network "i" in project year, m^3;

$[_i]$ index – independent water-supply network;
$[_b]$ index – relates to basic year.

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

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

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

N/A

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

N/A

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

There are no leakages. Dynamic baseline (based on data collected for monitoring) excludes all possible leakages.

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:

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

No leakage is expected.

D.1.3.2. Description of formulae used to estimate leakage (for each gas, source etc.; emissions in units of CO_2 equivalent):

No leakage is expected.

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

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

$$ER = \mathbf{E_b - E_r.} \quad (12)$$

ERU– emission reduction units, t CO_2e;
E_r – project emissions, t CO_2e;
E_b – basic emissions, t CO_2e.

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

Implementation of this Project provides for replacement of pumping equipment and water distribution networks; the "Deficiency acts"[11] will be executed for the equipment to be put out of operation (pumps, electric motors, steel pipes); dismantled equipment will be delivered to Lugansk Regional Council for subsequent application as secondary materials. In accordance with Ukrainian legislation "On system of collecting, sorting, transportation, processing and utilization of used tare (package) and solid domestic waste"[11] the company doesn't monitor utilization of solid domestic wastes".

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

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

Operational structure includes Supplier's ("Luganskvoda Ltd.") operational departments (repair-and-renewal operations, etc.) and personnel for pumping stations exploitation.
Management structure includes administration department s of the Supplier and project's specialists-developers (VEMA S.A.).
Detailed operational structure and management structure is give in the Annex 3.

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

Monitoring plan is determined by VEMA S.A., project's developer, and "Luganskvoda Ltd.", supplier of the project.

VEMA S.A.:
Kyiv, Ukraine
Apostolaka S.B.
Telephone: (+38 050) 473 55 67

Fax: (+38 044) 206 84 43
e-mail: asb@vemacarbon.com

"Luganskvoda Ltd.":
Lugansk, Ukraine
Anchyshkin A.G.
Telephone: (+38 050) 328 75 89
Fax: (+38 0642) 34 14 03
e-mail: energo@klv.lg.ua

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Since it is impossible to apply methodological calculations described in Section B (Project monitoring plan) for preliminary estimation of project emission reduction, specific formulaes were elaborated for preliminary estimation of project emission reductions, stated in Sections E.1 and E.4. Since in the course of project's elaboration quantity of supplied water and consumed electric energy are unknown, the project's developers are guided by data known at such stage of calculation, namely basic quantity of supplied water, total quantity of consumed electric energy, efficiency factor of pumping equipment and water loss in the water-supply network.

Results of corresponding calculations with application of these formulas are given in Accompanying documents 1-2. These calculations are based on improvement of equipment efficiency. Identification of parameters corresponding to these formulas is stated in Accompanying documents 1-2.

Each accompanying document contains calculation of GHG emission reduction corresponding to certain technology applied in JI project:
Accompanying document 1 – Replacement, rehabilitation and implementation of frequency regulation of electric drives of the water supply pumps.
Replacement of old pumps with low efficiency factor by new high-effective ones; transfer of load from the pumps with outdated equipment to the pumps with high-effective equipment.

Accompanying document 2 – Replacement of water distribution networks.

Replacement of main and distribution pipelines with diameters 820-47 mm by new ones. This will make it possible to reduce electric energy consumption for pumps' feed.

Accompanying document 3 – contains total amount of emission reductions for each year according to the introduced technology.

Accompanying document 4 – schemes of water-supply networks involved in project.

Accompanying document 3 contains references to all Accompanying documents 1-2. .

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

Project emissions

$$E^r = \sum ([P_{r(i)} - V_{(i)}] * EF, \quad (13)$$

where:
E^r – project emissions of pumping stations for each reporting year, tCO_2;
$P_{r(i)}$ –total amount of electric energy necessary for transportation of water to the suppliers in "i" system in basic year, kWh;
$V_{(i)}$ – electric energy saving due to rehabilitation of water-supply network, kWh;

$[_i]$ index – water-supply network;
$[_r]$ index – relates to reporting year.

$$P_{r(i)} = [P_{b(i)} * BBE_i] / [PBE_i], \quad (24)$$

where:

P_b – total amount of electric energy necessary for transportation of water to the suppliers in basic year, kWh;

BBE_i - Efficiency Factor of pumps in basic year, %;

PBE_i - Efficiency Factor of pumps in project year, %;

[$_i$] index – independent water-supply network;

[$_r$] index – relates to reporting year.

Parameter **BBEi** - Efficiency Factor in basic year shall be taken from published data of the pumps

$$V_{(i)} = P_{b(i)} - P_{b(i)} * (100-L_b)/(100-L_r), \quad (15)$$

where:

$P_{b(i)}$ – total amount of electric energy necessary for transportation of water to the suppliers in "i" system in basic year, kWh;

L_b – water loss in the water supply network under baseline scenario, %[17];

L_r – water loss in the water supply network under project scenario, %.

[$_i$] index – independent water-supply network;

[$_b$] index – relates to basic year.

Year	Project emissions (tCO_2 equivalent)
2008	306464
2009	262136
2010	251579
2011	251579
2012	251579
Total (tCO_2 equivalent)	1323337

Table 11. Estimated project emissions for the period from January 01, 2008 to December 31,2012

Year	Project emissions (tCO_2 equivalent)
2013	251579
2014	251579
2015	251579
2016	251579
2017	251579
2018	251579
2019	251579
2020	251579
2021	251579
2022	251579
2023	251579
2024	251579
2025	251579
2026	251579
2027	251579

[17] Source of data: «Form 2 TP Water Industry» is produced by the "Luganskvoda Ltd.".

Total (tCO_2 equivalent)	3773685

Table 12. Estimated project emissions for the period from January 01, 2013 to December 31, 2027

Detailed information on calculations is given in the Accompanying 1-2.

E.2. Estimated leakage:

There are no expected leakages.

E.3. Sum E.1 and E.2.:

Since there are no leakages the sum E.1 and E.2 will be equal to E.1 (see Table 4).

E.4. Estimated baseline emissions:

For preliminary estimation of project emission reductions specific formulaes stated in section E.1 and E.4 were elaborated and applied.

Baseline emissions

$$E^b = P_b * EF \quad (16)$$

[$_b$] index – relates to basic year.

where:
E^b –CO_2 emissions due to generation of electric energy for state electrical gridconsumed by the pumping stations, where the energy-saving technologies will be implemented, t CO_2 e.
P_b – total amount of electric energy necessary for water supply to the consumers in basic year, kWh (with the view of conservatism principle, basic quantity of electric energy for project year will be the same as in 2007).
EF – carbon emission factor subject to electric energy consumption reduction, CO_2e/ t. kWh

Year	Expected baseline emissions (tCO_2 equivalent)
2008	403140
2009	403140
2010	403140
2011	403140
2012	403140
Total (tCO_2 equivalent)	2015700

Table 13. Estimated project emissions for the period from January 01, 2008 to December 31,2012

Year	Expected baseline emissions (tCO_2 equivalent)
2013	403140
2014	403140
2015	403140
2016	403140

2017	403140
2018	403140
2019	403140
2020	403140
2021	403140
2022	403140
2023	403140
2024	403140
2025	403140
2026	403140
2027	403140
Total (tCO_2 equivalent)	6047100

Table 14. Estimated project emissions for the period from January 01, 2013 to December 31,2027

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

Project emission reduction = Baseline emissions - (Project emissions + Estimated leakages). (17)
All results of estimation of project emission reductions are given in Table 6.

Year	Expected emission reductions (tCO_2 equivalent)
2008	96676
2009	141004
2010	151561
2011	151561
2012	151561
Total (tCO_2 equivalent)	692363

Table 15. Estimated emissions reduction for the period from January 01, 2008 to December 31,2012

Year	Expected emission reductions (tCO_2 equivalent)
2013	151561
2014	151561
2015	151561
2016	151561
2017	151561
2018	151561
2019	151561
2020	151561
2021	151561
2022	151561
2023	151561
2024	151561
2025	151561
2026	151561

2027	151561
Total (tCO_2 equivalent)	2273415

Table 16. Estimated emissions reduction for the period from January 01, 2013 to December 31,2027

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

Year	Expected project emissions (tCO_2 equivalent)	Expected leakage (tCO_2 equivalent)	Expected baseline emissions (tCO_2 equivalent)	Expected emissions reduction (tCO_2 equivalent)
2008	306464		403140	96676
2009	262136		403140	141004
2010	251579		403140	151561
2011	251579		403140	151561
2012	251579		403140	151561
Total (tCO_2 equivalent)	1323337		2015700	692363

Table. 17. Table providing results of emission reduction estimation during the first period of commitments.

Year	Expected project emissions (tCO_2 equivalent)	Expected leakage (tCO_2 equivalent)	Expected baseline emissions (tCO_2 equivalent)	Expected emissions reduction (tCO_2 equivalent)
2013	251579		403140	151561
2014	251579		403140	151561
2015	251579		403140	151561
2016	251579		403140	151561
2017	251579		403140	151561
2018	251579		403140	151561
2019	251579		403140	151561
2020	251579		403140	151561
2021	251579		403140	151561
2022	251579		403140	151561
2023	251579		403140	151561
2024	251579		403140	151561
2025	251579		403140	151561
2026	251579		403140	151561
2027	251579		403140	151561
Total (tCO_2 equivalent)	3773685		6047100	2273415

Table. 18. Table providing results of emission reduction estimation after the first period of commitments.

SECTION F. Environmental impacts

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

In accordance with legal basis of Ukraine "On environmental protection"[18] and "Contents and structure of materials for assessment of environmental impact in the course of projecting and building of enterprises, houses and constructions"[19], the "Luganskvoda Ltd." is not obliged to elaborate Assessment of Environmental impact for such project.
No ecological permits are necessary for water transportation. The only impact on environment is dismantled equipment, which will be applied in the future as secondary material.
Implementation of this project will make it possible to improve servicing of water consumers. Experience of the employees of "Luganskvoda Ltd." and adherence to the norms "On drinking water and drinking water supply"[5] make it possible to minimize occurrence of emergency situations in the course of this project implementation.

There will be no transboundary impacts of project activity in accordance with their determination in the text of "Convention on Long-range Transboundary Pollution" ratified by Ukraine.

The Project implementation doesn't provide for any negative impacts on environment.
"Luganskvoda Ltd." has permits for :Special water use" for all sites and department.

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

Impact on water medium

There is no influence on water medium.

Impact on air

Impact on air is absent.

Impact on land use.

Impact on land/soils use is absent.

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

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

SECTION G. Stakeholders' comments

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

Since the project activities do not imply any negative environmental impact and negative social effect, special public discussions were not necessary. Consultations with Stakeholders were conducted at the meetings of local authorities.
No comments were received from Stakeholders.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organisation:	"Luganskvoda Ltd."
Street/P.O.Box:	Proletariatu Donbasu Quarter
Building:	166
City:	Lugansk
State/Region:	Lugansk region
Postal code:	91047
Country:	Ukraine
Phone:	+ 38 0642 34 14 15
Fax:	+ 38 0642 34 14 15
E-mail:	energo@klv.lg.ua
URL:	http://www.klv.lg.ua/
Represented by:	
Title:	General Director
Salutation:	
Last name:	Maslak
Middle name:	Mykolayovych
First name:	Viktor
Department:	
Phone (direct):	+ 38 0642 34 14 15
Fax (direct):	+ 38 0642 34 14 15
Mobile:	
Personal e-mail:	

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

Annex 2

BASELINE INFORMATION

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

Parameter	**EF**
Unit of measurement	tCO_2e/ t. kWh
Description	Carbon emission factor for Ukrainian electrical grid
Source of data	Research data of Global Carbon B.V.[20]
Comments	Researches didn't take into consideration production of energy by nuclear power plants

Parameter	$\mathbf{M^3_b}$
Unit of measurement	m^3
Description	Total volume of water supplied to the consumers during the basic year
Source of data	Data of flow meters installed in lifting stations
Comments	Data allowing calculation of GHG emissions in basic year; information will be archived in paper and electronic forms

Parameter	$\mathbf{M^3_{i,r}}$
Unit of measurement	m^3
Description	Volume of water supplied to consumers during project year in «i" water-supply network
Source of data	Data of flow meters installed in lifting stations
Comments	Data allowing calculation of GHG emissions in basic year; information will be archived in paper and electronic forms

Parameter	$\mathbf{kWh_b}$
Unit of measurement	kWh
Description	Total amount of electric energy necessary for water transportation to consumers during the basic year
Source of data	Data of electricity supply meters installed at pumping stations
Comments	Data allowing calculation of GHG emissions in basic year; information will be archived in paper and electronic forms

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

Annex 3

MONITORING PLAN

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

A. Technical description of the project

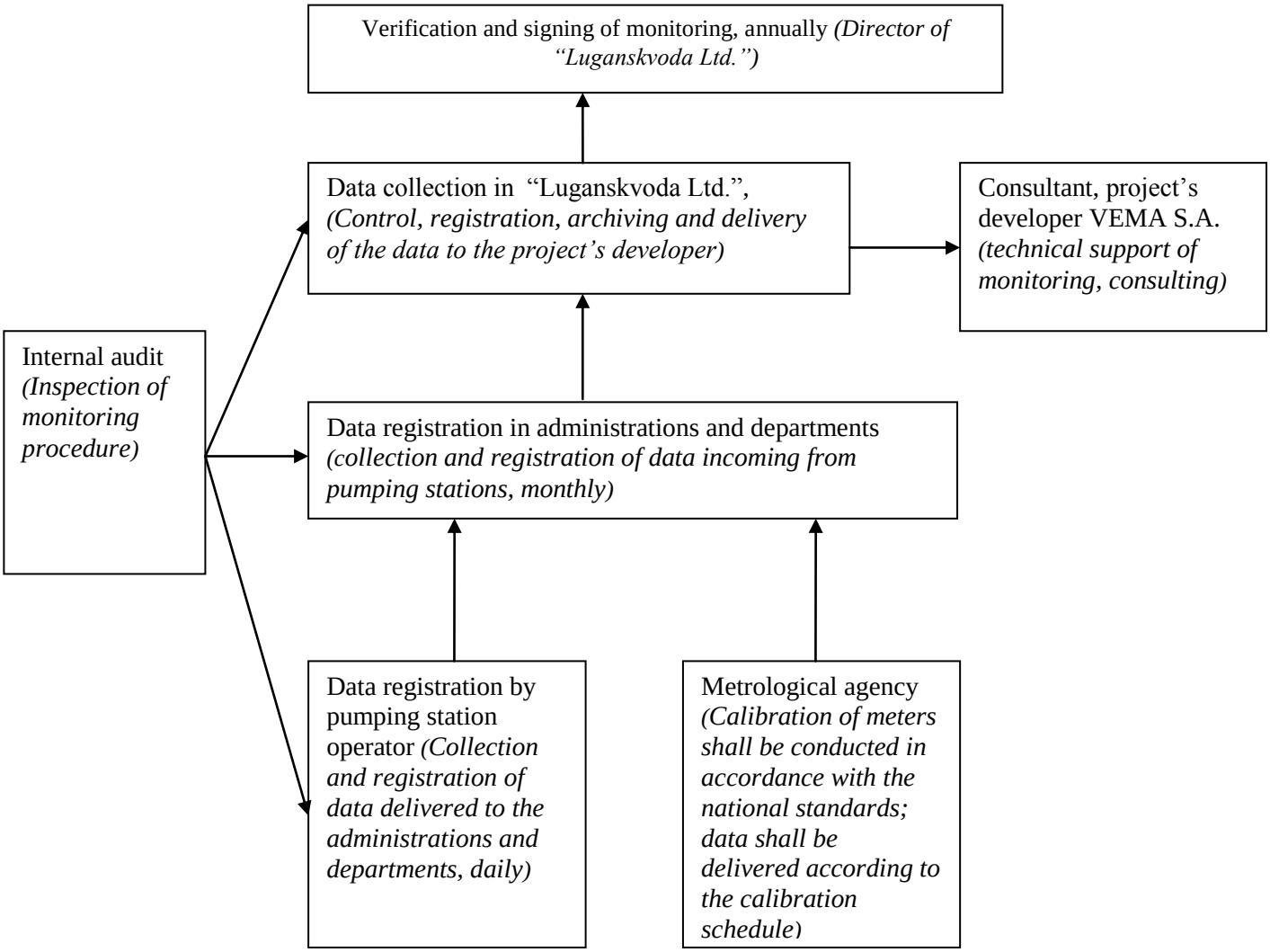
Arrangements implemented for increase in efficiency of "Luganskvoda Ltd." consist in the following:

- Old pumps with low efficiency of 50-60% will be replaced by the pumps with the efficiency of 81-89%. Rehabilitation or replacement of equipment will be fixed in the acts of commissioning and documentation confirming purchase and assembly of new equipment
- Optimization of the technological process of water pumping. Transfer of load from pumping plants with old equipment to the pumping stations fitted with high-performance equipment. Monitoring will be conducted by means of detailed layout of the pipelines of water-supply network subject to marking of main diameters of the pipeline;
- Introduction of automatic air valves on water mains for decrease of pressure and improvement of discharge capacity. Monitoring of new equipment introduction will be conducted by means of the documentation confirming purchase and assembly of new equipment;
- Replacement of water-supply networks. Rehabilitation or replacement of pipes will be fixed in the acts of commissioning;
- Installation of new groups of record keeping devices. Monitoring of new equipment introduction will be conducted by means of the documentation confirming purchase and assembly of new equipment;
- Installation of frequency regulators. Monitoring of new equipment introduction will be conducted by means of the documentation confirming purchase and assembly of new equipment;

  Documentation confirming purchase and assembly of new equipment will be archived and kept at "Luganskvoda Ltd." during 2 years after delivery of emission reduction units generated by the project.

B. Control of monitoring organization

Structure of monitoring data collection is the following:



C. Monitoring procedures

Measures for control of electric energy consumed by "Luganskvoda Ltd.":

1. Current control of electric energy meters' operation is conducted during design period (design month is determined by the conditions of the contract of electric energy supply);
2. On the day stipulated by the contract (as a rule it is 00 hours 00 minutes on the 1st day of month following the design month) the chief of site or his authorized representative shall take the readings of electric energy meters (electric energy meters are the devices, passed state certification, registered under the contractual conditions and jointly sealed by the representatives of power supplying organization and "Luganskvoda Ltd." subject to execution of act of sealing). The head of site shall hand over obtained information to the chief power engineer department;
3. "Report of electric energy meters' readings" shall be executed according to the readings of electric energy meters of all sites; engineer involved in electric energy bills shall provide this Report to the subscriber department of energy supplying organization;
4. Following the "Report of electric energy meters' readings" subscriber department of energy supplying organization shall execute "Act of supplied electric energy", approved by the company's round seal and hand over such act to the department of "Luganskvoda Ltd." for confirmation.
5. The representative of "Luganskvoda Ltd." shall provide approved "Act of supplied electric energy" to the subscriber department of energy supplying organization, wherein he obtains invoices for payment.
6. All bills for payment shall be kept by "Luganskvoda Ltd." in paper form.

Measures for control of water supplied to the consumers at "Luganskvoda Ltd.":

1. Water extracted from water objects of "Luganskvoda Ltd." shall be accounted by flow meters located at pumping stations of water lifting wells;

2. Readings shall be taken every hour and fixed in logs of established form PID-11;

3. Data about volume of water lifted from second-lifting station for previous day shall be handed over every day at 00:00 o'clock to control department of each production unit

4. Persons responsible for statistical reporting under the form 2-TP (water industry) shall execute the statements on the ground of dispatching record of taken water before 10th day of each month and hand over them to corresponding services of management personnel of "Luganskvoda Ltd.";

5. Report 2-TP (water industry) shall be produced every three months to the Lugansk Department of Water Resources after its verification by production-technical department and sales department of management bodies. Payment for water supplied to consumer shall be made according to such report.

D. Calibration of meters

Meters shall be calibrated according to the national standards.

E. Recording and archiving of data

The person responsible for joint implementation project appointed by the project's owner shall monitor data in electronic and paper form. Electronic documents shall be printed and kept.
Project's owner shall keep the copy of the acts of supplied electric energy (original of the acts shall be kept by subscriber department).

All data and documents in paper form shall be archived and one backup copy shall be handed over to project's coordinator.
All data shall be kept during 2 years after delivery of emission reduction units generated by the project.

F. Trainings

Employees of VEMA S.A. will consult the persons responsible for monitoring elaboration at "Luganskvoda Ltd." before starting project activity and during project period

Total reduction of emissions

Formulae 1 – Quantity of emission reduction units (ER)	
	$ER = E^b - E^r$
	where: E^b and E^r – CO_2 emissions as a result of electric energy consumption for water supply, in basic and reporting years correspondingly, t CO_2e; [$_b$] index – relates to basic year; [$_r$] index – relates to reporting year.

Project emissions

Formulae 3 – Annual project emissions **(**E^r)	
	$E^r = kWh_r * EF$,
	EF- carbon emission factors for Ukraine in "y" year, taken from «Study "Standardized emission factors for the Ukrainian electricity grid" (Version 5, 02 February 2007) developed by Global Carbon B.V.»; kWh_r - total quantity of electric energy kWh, necessary for water transportation to the consumers in project year, kWh; [$_r$] index – relates to reporting year.

Formulae 6 – Total quantity of electric energy kWh, necessary for water transportation to the consumers in "y" year of project scenario	
	$kWh_r = \sum kWh_{r,i}$
	$kWh_{r,i}$ - quantity of electric energy necessary for water transportation to the consumers in water-supply network "i" in project year; kWh; [$_i$] index – water-supply network; [$_r$] index – relates to basic year.

Baseline emissions

Formulae 2 – Annual baseline emissions **(**E^b)	
	$E^b = M^3_r * PPER * EF_,$
	PPER- pre-project efficiency rate, kWh/m^3; EF_r- carbon emission factor for Ukraine in "y" year, taken from «Study "Standardized emission factors for the Ukrainian electricity grid" (Version 5, 02 February 2007) developed by Global Carbon B.V.»; M^3_r - total amount of water supplied to the consumers in project year, m^3. [$_b$] index – relates to basic year; [$_r$] index – relates to reporting year.

Formulae 4 – pre-project efficiency rate, kWh/m^3	
	$PPER = kWh_b / M^3_b$
	kWh_b- total quantity of electric energy, necessary for water transportation to the consumers in basic year, kWh; M^3_b- total amount of water supplied to the consumers in basic year, m^3 [$_b$] index – relates to basic year.

Formulae 5 – total amount of water supplied to consumers in basic year, m^3	
	$M^3_r = \sum M^3_{i,r}$
	$M^3_{i,r}$- amount of water supplied to consumers in the water-supply network "i" in project year, m^3 [$_i$] index – water-supply network; [$_b$] index – relates to basic year