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

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

"**Greenhouse gas emission reduction due to modernization of objects of the AR Crimea water complex and the North-Crimean canal**"

Sectoral scope:

1. Energy industries (renewable - / non-renewable sources);

3. Energy demand.

PDD Version: 03.

Dated April 5, 2013.

A.2. Description of the project:

Project objective is to reduce greenhouse gas emissions due to reducing of fuel and energy resources (FER) consumption by means of modernization of objects of the AR Crimea water complex and the North-Crimean canal, including pumping and boiler equipment replacement and modernization, canal and pipe network rehabilitation, as well as implementation frequency controllers and solar collectors, installation of auxiliary transformers, operation mode improvement measures, implementation of modern control, monitoring and automation systems, as well as installation of modern water and electricity measurement equipment. The purpose of the project is sustainable development of the AR Crimea through implementation of energy saving technologies.

Project is realized by 16 water industry departments acting at the territory of the Crimea peninsula (see **Section A.3)**. All these organizations are the nonprofit government-financed organizations and belong to the management scope of the State Water Resources Agency of Ukraine. Their activity is managed by the Republic Committee on water industry construction and irrigated agriculture of the AR Crimea.

The project includes 311 pumping stations, 18 boiler-houses, 405.5 km of water supply networks and 1837.2 km of open canal networks, 6 water-storage reservoirs (see **Appendix 1 "Objects included into the JI project"**).

a) Situation existing prior to the starting date of the project:

The common practice for the Departments of the water complex in Ukraine including Departments that implement this project is to fulfil annual minimal repairing of the state melioration systems to keep them working. In fact, mainly repairing of water supply networks, canals, pump and boiler equipment parts which malfunction might cause accidents are usually executed.

b) Baseline scenario:

For Baseline scenario, the economically feasible and realistic scenario with very slow rehabilitation activities was chosen. Tariffs for transport and supply of water for watering of irrigated or humidification of drained lands do not include the resources for prospective modernization of the state melioration systems, only the resources for probable necessary repairing after possible accidents. Minimal annual repairing of the systems doesn't lead to reduction of baseline anthropogenic GHG emissions, because this is accompanied by degradation of the whole systems with droop of the overall efficiency, thus the overall actual emissions would be only increased. This scenario is not environmentally favorable for the near future, but economically such scenario is the most attractive.

c) Project scenario

The project provides the increase of fuel and energy resources (FER) consumption efficiency to reduce greenhouse gas emissions relative to current practice. The following activities will ensure fuel and energy resources saving:

- Replacement and rehabilitation of pump equipment;
- Implementation of frequency controllers at electric drives of pumps;
- Reduction of leaks in water pipe network (replacement and rehabilitation of pipes; sealing of control and stop armature and valves, etc.);
- Rehabilitation of open canals;
- Rehabilitation of the structure facilities complex of water industry: hydraulic units, gauging stations, dams, canals, pipelines, reservoirs, ponds, pumping stations, collector-drainage network, wells, etc., cleaning of the water reservoirs;
- Installation of auxiliary transformers as well as rehabilitation of transformer equipment at transformer substations;
- Optimization of operation modes of electric power supply of pump unit drives;
- Switching of coal-operating boiler-houses to the fuel with low carbon content (natural gas) and to the renewable source (wood) with corresponding replacement of old boilers by the new ones;
- Replacement of old operating boilers with low efficiency by the new highly efficient ones;
- Rehabilitation and modernization of the obsolete but able to work boilers with using various energy saving technologies.
- Heat modernization of administrative, industrial and utility buildings:
- Reduction of losses in heat distribution network (optimization of routing, replacement and rehabilitation of pipes, sealing of control and stop valves, etc.);
- Optimization of lighting operation modes and implementation of energy efficient lighting devices;
- Installation of solar and wind energy units;
- Operation mode improvement measures, including:
  - ✓ realization of optimal operation modes of irrigation systems,
  - ✓ realization of optimal water levels at canals with motor water-lifting,
  - ✓ optimization of the operation modes of transformers in the autumn-winter period (disable of unused transformers) to avoid idle running losses,
  - ✓ realization of optimal operation modes of pump stations,
  - ✓ realization of pumping units operation in the optimal zone of pressure characteristic,
  - ✓ realization of optimal operation modes of drainage pumping systems,
  - ✓ reduction of usage of electric heating of buildings.
- Implementation of modern control, monitoring and automation systems as well as installation of modern water and electricity measurement equipment.

Implementation of the project will provide substantial economic and social benefits and will make positive impact on the environment of the AR Crimea. The social impact of the project is positive since after project implementation the water transport and supply services will be improved.

The brief history (the main milestones) of the project (including its JI component):

March, 2004 - Institute of Engineering Ecology has proposed to Republic Committee on water industry (Rescomvodhosp) of the AR Crimea to develop the Joint Implementation Project on Greenhouse Gas Emission Reduction due to rehabilitation of objects of the AR Crimea water complex .

April, 2004 – The Decision on starting of development and realization of the Joint Implementation project in accordance with flexible mechanisms of Kyoto protocol at the objects of Republic Committee on water industry of the AR Crimea was made (Protocol of the Rescomvodhosp of the AR Crimea Technical Council meeting dated 16/04/2004).

July, 2012 – Agreement on Cooperation and Joint Activity for realization of the JI project on GHG emission reduction was made between the Krasnoperekopsk DWI, Bakhchysaray IDWI, Dzhankoy DWI, Kirovske IDWI, Krasnohvardiyske IDWI, Lenine IDWI, Nyzhnyohirskyy IDWI, Pervomayske DWI, Pobedne IDWI, Rosdolne IDWI, Saky IDWI, Salgirske IDWI, Sovetskyy DWI, Tayganske IDWI, CCD and NCCD (Agreement No. 01/2012 dated 27/07/2012).

October, 2012 – Agreement on development and execution of the JI project on GHG emission reduction due to modernization of objects of the AR Crimea water complex and the North-Crimean canal was signed between the Krasnoperekopsk DWI and the Institute of Engineering Ecology (Agreement No. 803/241 dated 26/10/2012).

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)	Krasnoperekopsk DWI	No
Poland	"IMEX ENERGO", Sp. z o. o.	No
* Please indicate if the Party involved is a host Party.		

Table A.1. Project participants

- ***Krasnoperekopsk DWI*** - organization acting as Project Applicant and Supplier of GHG emission reductions on behalf of all participants of the Agreement on Cooperation and Joint Activity No. 01/2012 dated 27/07/2012. It represents the interests of partners of the Agreement and is responsible for the organizational aspects of the JI project.

Project is realized by the following water industry departments – participants of the Agreement on Cooperation and Joint Activity No. 01/2012 dated 27/07/2012:

1. Krasnoperekopsk department of water industry (further mentioned as Krasnoperekopsk DWI);
2. Bakhchysaray inter-district department of water industry (further mentioned as Bakhchysaray IDWI);
3. Dzhankoy department of water industry (further mentioned as Dzhankoy DWI);
4. Kirovske inter-district department of water industry (further mentioned as Kirovske IDWI);
5. Krasnohvardiyske inter-district department of water industry (further mentioned as Krasnohvardiyske IDWI);
6. Lenine inter-district department of water industry (further mentioned as Lenine IDWI);
7. Nyzhnyohirskyy inter-district department of water industry (further mentioned as Nyzhnyohirskyy IDWI);
8. Pervomayske department of water industry (further mentioned as Pervomayske DWI);
9. Pobedne inter-district department of collector-drainage systems (further mentioned as Pobedne IDCDS);
10. Rosdolne inter-district department of water industry (further mentioned as Rosdolne IDWI);
11. Saky inter-district department of water industry (further mentioned as Saky IDWI);
12. Salgirske inter-district department of water industry (further mentioned as Salgirske IDWI);
13. Sovetskyy department of water industry (further mentioned as Sovetskyy DWI);
14. Tayganske inter-district department of water industry (further mentioned as Tayganske IDWI);
15. Connecting canal Department (further mentioned as CCD);
16. The North-Crimean canal Department (further mentioned as NCCD).

Krasnoperekopsk DWI, Bakhchysaray IDWI, Dzhankoy DWI, Kirovske IDWI, Krasnohvardiyske IDWI, Lenine IDWI, Nyzhnyohirskyy IDWI, Pervomayske DWI, Pobedne IDWI, Rosdolne IDWI, Saky IDWI, Salgirske IDWI, Sovetskyy DWI, Tayganske IDWI, CCD provide the continuous water supply to customers in the AR Crimea, including maintenance and operation of water industry facilities and the state melioration systems of inter-industry significance, execution on a contractual basis of the technical

maintenance of farm-irrigation systems and water supply for irrigation, execution of the current and capital repairs of inter-industry and melioration systems and water industry objects. They realize the unified technical policy with use of science and technology achievements, new technologies and best practices, put into operation the melioration systems, support providing of the set of technical-organizational measures for protection and maintenance at the working condition of all elements of the state melioration systems. Perform measures for prevention of dangerous impacts of water and its results liquidation, organize accident-free passes of a flood at objects of a Department, participate in development and providing of measures for protection settlements and agricultural lands from flooding and underflooding.

Department of the North-Crimean canal provides the continuous supply of the Dnipro water to other Departments, including maintenance of namely the main canal from the Kahovka water-storage reservoir to Kerch city, water-lifting, distribution and drainage pump stations, upthrusting-regulatory structures, sag pipes, aqueducts, accidental discharges, conduit pipes under the canal, etc. The North-Crimean canal solves issues of irrigation and watering of the North and East Crimea lands and providing them with technical and drinking water.

Krasnoperekopsk DWI represents the interests of all project activity participants as an Applicant and Supplier of GHG emission reduction units.

Historical details[1]:

Krasnoperekopsk department of irrigation systems was founded on 5th of September, 1963, in accordance with the Order of State Water Resources Agency of Ukraine No. 246 dated 05.09.1963. It was renamed into the Krasnoperekopsk department of water industry by the Order of State Water Resources Agency of Ukraine No. 315 dated 10/12/2004.

The main activity of Krasnoperekopsk DWI is devoted to ensuring the constant maintenance of the inter-farm melioration network in the technically operative condition, and provision of water supply services to the water consumers.

Krasnoperekopsk DWI executes supply of the Dnipro water from the North-Crimean canal to Pervomayske, Rasdolne and Saky departments of water industry, for irrigation through its own network, as well as to the Mizhgirne water storage reservoir for drinking needs of the inhabitants of cities and towns of the Crimea.

The department includes three operation divisions: Krasnoperekopsk, Voinske and division of operation of drainage systems, as well as the workshop for repairs of electromechanical equipment, pump stations division, etc.

Two agricultural areas are territorially serviced by the department: Krasnoperekopsk district with the irrigation area of 32 924 ha and the agricultural area of the Armiansk city with the area of 3358 ha. The length of the water pipe network is 1.6 km, of the water supply canals – 61.2 km.

Contact data of the Krasnoperekopsk DWI are listed in Annex 1. Additional information: EDRPOU code 01033993; Codes of the Economic activity according to the KVED: 01.61 Auxiliary activities for plant cultivation; 42.91 Construction of water facilities; 71.12 Activities in the field of engineering, geology and geodesy, services of technical consultation in these areas; 41.20 Construction of residential and non-residential buildings.

[1] http://www.vodhoz.crimea.ua/krasnoperekopskoe-muvch/krasnoperekopskoe-upravlenie-vodnogo-chozyaystva

- ***"IMEX ENERGO", sp. z o. o.:*** is the purchaser of the emission reduction units generated from this Project.

Historical details:

«IMEX ENERGO», sp. z o. o., REGON 651542435, was created on December 9th, 2003 in Przemysl, Poland. The main Company's activity is exportation, importation, and supply of specialized electric devices for the energy sector, as well as natural gas, petroleum, liquefied petroleum gas, petrol, and electric energy supply.

The company also realizes some innovative-investment and ecological projects in Poland and Ukraine.

In 2010 the legal address of the Company was changed, and now it is – Rzeszow, Przemysłowa, 14.

Thereafter, the main Company's activity is:

- development problem - stripped gas provision from Ukraine to Poland (Podkarpackie region);
- Chervonograd cogeneration systems 24 MW technical documentation elaboration (PJSC Energoinwest);
- project on power generation investments, from the use of stripped gas in Boryslav, Ukraine (CHP 12 MW) – the project received the letter of approval No.2 from the Ukrainian Ministry of ecology in 2006;
- great quantity of CHP and equipment, boilers, etc., import to the Ukraine;
- project starting with the help of wind power ("Kryla vitru" project in the Truskavec power station 40 MW);
- biomass organization and obtaining, briquetting equipment assembly, as well as supply from Ukraine to Poland;
- collaboration with the local thermal and electric stations in the sphere of investments to the operational network of heat distribution, from cogeneration with the use of biomass as the fuel;
- preparation of JI projects according to the article 6 of the Kyoto protocol on electricity saving in Ukrainian grid, together with the Ukrainian companies: Ecological Energy Systems, Ltd. and East European Energetic Union, Ltd.

A.4. Technical description of the project:

A.4.1. Location of the project:

The Project is located in the south part of Ukraine, at the Autonomous Republic of Crimea territory (Fig.A.1).

Fig. A.1. The map of Ukraine with administrative division

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 4th, 2004[2], it enters into the list of the countries of the Annex I to the UN FCCC and into the list of the countries of the Annex B to the Kyoto Protocol to UNFCCC[3], and is eligible for the Joint Implementation projects.

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

The AR Crimea[4] occupies the territory of Crimean peninsula, located in the south of Eastern Europe between 44° 23'- 46° 15' north latitude and 32° 29'- 36° 39' east longitude. The capital of it is the Simferopol city.

The republic territory is 26.1 thousand km^2. Adjacent regions are Kherson and Zaporizhzhya regions of Ukraine, Krasnodar Land of the Russian Federation.

Climate zone of the AR Crimea possess the intermediate position between temperate and subtropical geographic zones that promotes the soft climate of the Peninsula and the large number of sunlight hours.

The territory of the AR Crimea is divided into 14 administrative districts: Bakhchisaray, Bilogirsk, Dzhankoy, Kirovske, Krasnohvardiyske, Krasnonoperekopsk, Lenine, Nyzhnyohirskyy, Pervomayske, Rozdolne, Saky, Simferopol, Sovetskyy, Chornomorskyy districts and the territory of 12 city councils.

[2] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1430-15
[3] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?page=1&nreg=995_801
[4] http://rada.com.ua/ukr/RegionsPotential/Crimea/

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

The Project includes objects of the AR Crimea water complex and the North-Crimean canal that are located in the inhabited localities and outside of they boundaries in all 14 regions of the AR Crimea. More detailed information is presented in the Table 2 below and in the **Appendix 1**.

Bakhchysaray district	Bakhchisaray c., Furmanovka v., Poshtove v., Kuybysheve v., Khmelnytske v.
Bilogirsk district	Bilogirsk c., Bulanovo v.
Dzhankoy district	Dzhankoy c., Azovske t., Pobedne v., Krymka v., Subotnyk v., Stolbove v., Chaykyne v., Dymivka v., Nove Zhyttia v., Prostorne v., Aprelivka v., Stalne v., Hostepryemne v., Kondrateve v., Rubynivka v., Kolosky v., Tsilynne v., Vypasne v., Ozerky v., Luhanske v., Izumrudne v; the territory of Novokrymske v/c, Krymkivske v/c, Lobanivske v/c, Yarkivske v/c, Roshynske v/c, Maslivske v/c, Zarichnenske v/c, Pobedne v/c, Tabachnenske v/c, Mayske v/c, Stalnenske v/c, Mykhailivkse v/c, Chkalivske v/c, Zavit-Leninske v/c, Yasnopolyanske v/c
Kirovske district	Kirovske town, Synytsyne v., Dolynne v., Pryvitne v., Babenkove v., Abrykosivka v., Partyzany v., Pervomayske v., Novopokrovka v., Vladyslavivka v., Yarke Pole v.
Krasnohvardiyske district	Krasnohvardiyske town, Rubynivka v., Marianivka v., Plodorodne v., Ulyanovka v., Nekrasove v., Novomykilske v., Grygorovka v., Krasnyy Partyzan v., Kotelnykove v., Dubrovske v., Karpivka v., Pryame v., Leninske v., Amurske v., Poltavka v., Krasnoznamyanka v., Zernove v., Yastrubivka v., Krasna Polyana v., Izvestkove v., Myrolyubivka v., Novoestoniya v., Yantarne v., Traktove v.
Krasnonoperekopsk district	Krasnoperekopsk city, Armiansk city, Ishun v., Suvorovo v., the territory of Illinske v/c, Mahazynka v/c, Voinske v/c, Bratske v/c, Sovhoznenske v/c, Filativske v/c, Pochetnenske v/c, Novopavlivske v/c
Lenine district	Lenine town, Zelenyy Yar c., Frontove v., the teritory of Semysotske v/c, Illichivske v/c Vynohradnenske v/c, Ostaninske v/c, Novomykolaivske v/c, Mysivske v/c, Lenine v/c
Nyzhnyohirskyy district	Nyzhnyohirskyy town, the territory of Yakymivske v/c, Mytrofanivka v/c, Zheliabovske v/c, Uvarivske v/c, Zorkinske v/c, Chkalovske v/c, Novohryhorivsk v/c, Pshenychnenske v/c, Mykhailivske v/c
Pervomayske district	Pervomayske town, Oleksiivka v., the territory of Pravdivske v/c, Pervomayske v/c, Kalininske v/c, Krestyaninske v/c, Abrykosivske v/c, Kormivske v/c, Chernovske v/c, Gvardiyske v/c, Stahanovske v/c, Hryshynske v/c, Susanivske v/c, Sarybaske v/c, Stepnivske v/c, Voykove v/c
Rozdolne district	Rozdolne town., Novoselivske town, Ruchi c., Kovylne v., Chernyshevo v., Kukushkine v., Slavyanske v., Slavne v., Botanichne v., Zymyne v., Serebryanka v., Berezivka v., Kormove v.
Saky district	Saky city, Elizavetove v., Shyshkyne v., Romashkyne v., Uyutne v., Ilinka v., Natashyne v., Veselivka v., Pryvitne v., Vorobjove v., Veluke v., Stolbove v., Vogneve v., Shalashi v., Vodopiyne v., Zernove v., Trudove v., Krajne v., Vinogradove v., Herojske v., Skvortsove v., Chervone v., Krymske v., Zimino v., Nyzyne v., Stepne v.
Simferopol district	Simferopol c., Ukromne v., Shafranne v., Shyroke v., the territory of Zhuravlivska v/c

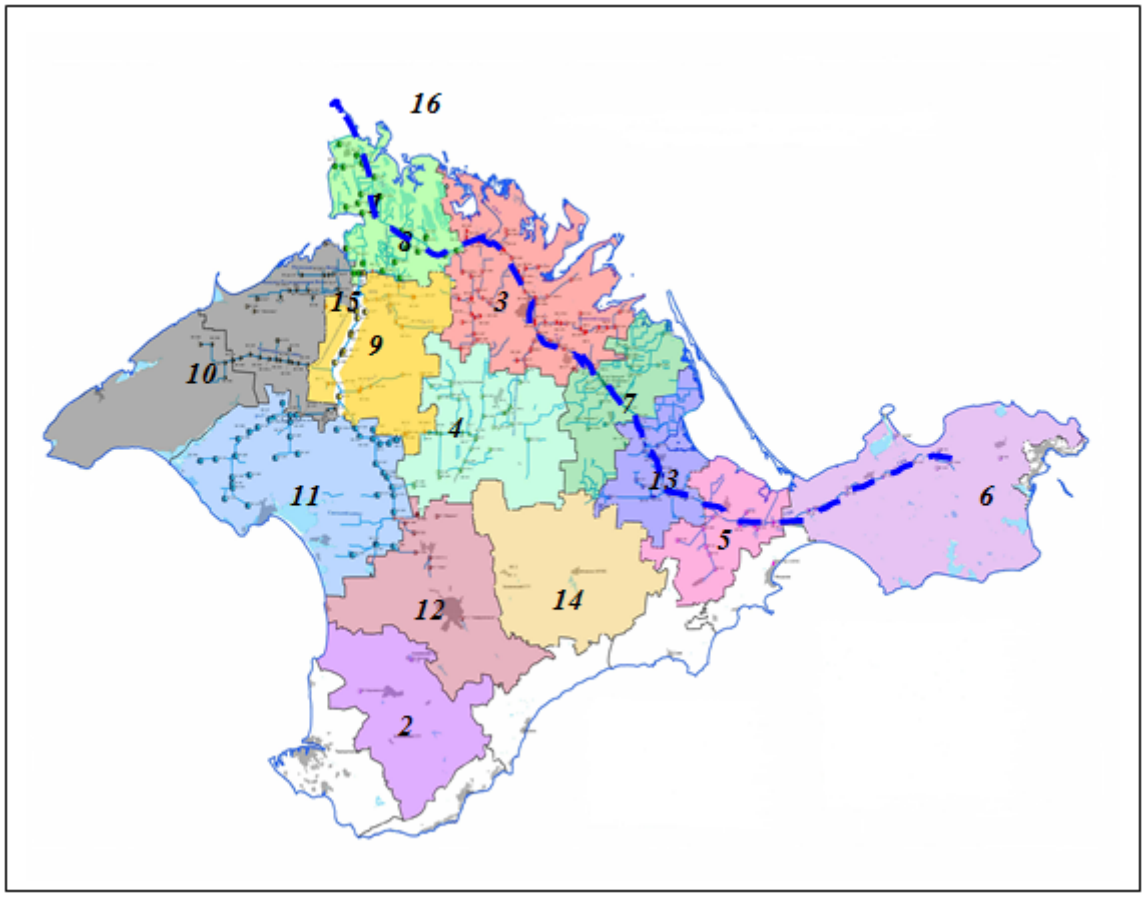
Sovetskyy district	Sovetskyy town, Kolomenske v., Hlibne v., Zavitne v.. Makiivka v., Razdolne v., Prudy v., Illichevo v., Chernozemne v., Oktyabrske v., the territory of Dmytrivka v/c
Chornomorskyy district	Kirovske v., Daleke v.

Table A.2. Location of objects of the AR Crimea water complex and the North-Crimean canal

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

AR Crimea is located between 44° 23'- 46° 15' north latitude and 32° 29'- 36° 39' east longitude.

Project activity covers objects of the departments of the AR Crimea water complex at the whole territory of the AR Crimea (Fig. A.2).



1- Krasnoperekopsk DWI
2- Bakhchysaray IDWI
3- Dzhankoy DWI
4- Krasnohvardiyske IDWI
5- Kirovske IDWI
6- Leninske IDWI
7- Nyzhnyohirskyy IDWI
8- Pobedne IDCDS
9- Pervomayske DWI
10- Rosdolne IDWI
11- Saky IDWI
12- Salgirske IDWI
13- Sovetskyy DWI
14- Tayganske IDWI
15- CCD
16- NCCD

Fig. A.2. Location of objects of the project activity at the territory of the AR Crimea

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

The main technologies and measures that will be used for modernization of objects of the AR Crimea water complex and the North-Crimean canal and will result in reduction of anthropogenic greenhouse gases emissions, with characteristics of their main technical parameters, are the following:

- Replacement of the obsolete pump equipment by the modern one will enable to considerably reduce power consumption for water pumping (Fig. A.3, A.4). Characteristics of the main technical parameters of new pumps scheduled to be installed are presented at the producer's websites listed in Table A.3 below.

Type of pump	Website of pump producer
OPV-2500	*http://www.agrovodcom.ru/reference/129.php*
K-160/20A	*http://gem2000.ru/nasos_konsolniy_tipa_k160/20*
VVN-1,5	*http://www.agrovodcom.ru/pump_vacuum/vvn1-15.php*
D500-65	*http://gidromash.com/catalog/index.html?idCatalog=10*
1D800-56	*http://gidromash.com/catalog/index.html?idCatalog=10*

Table A.3. Pumps producer's web sites

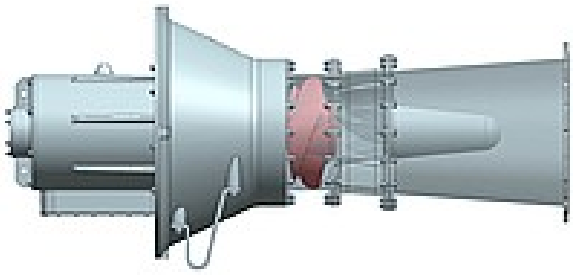


Fig. A.3. The axial-flow pump of submersible type OPV

Fig. A.4. Horizontal pump of D type

- Rehabilitation of pump equipment will enable to reduce redundant power consumption for water pumping:
  - Turning of pump impellers will enable to reduce the pump thrust to the optimum, to reduce hydraulic resistance, and correspondingly to reduce the specific power consumption for water pumping;

- Rehabilitation of the mechanisms and optimization of angle of turn blades of pump impellers;
- Replacement of the axis, bearings, the power cable and valves of pump units:
- Installation of vacuum valves at the siphon spillway will enable to reduce pump thrusts and the specific power consumption for water pumping.

- Implementation of frequency controllers at electric drives of pumps will result in considerable (by 5 – 40 % depending on operation mode) electricity saving. Technical characteristics of frequency controllers are presented at the producer's websites («Mitsubishi Electric» company and PJSC "Zaporizhskyy Electrical Equipment Plant") that are listed in Table A4:

Type of frequency controller	**Websites of producers**
FR-f740	*http://www.mitsubishi-automation.ru/products/inverters_fr_f_740.htm*
EKT 4D1	*http://www.zeaz.com.ua/*

Table A.4. Frequency controller producer's websites

- Replacement and rehabilitation of water supply networks pipes, sealing of control and stop valves, etc. will result in the reduction of water losses and will enable to supply the necessary amount of water with less water pumping and thereby to significantly reduce electricity consumption.
- Rehabilitation (water leakages removal) and cleaning from silt, vegetation and sediment of the open canals will lead to reduction of water losses, increasing of canal capacity and reduction of hydraulic resistance, which in turn will result in the reduction of necessary amount and hydraulic drop for water pumping, increasing of irrigation system efficiency and thus in reduction of the electricity consumption.
- Rehabilitation of the structure facilities complex of water industry: hydraulic units, gauging stations, dams, canals, pipelines, reservoirs, ponds, pumping stations, collector-drainage network, wells, etc., cleaning of the water reservoirs will result in reduction of water losses and hydraulic resistance to its flow that will result in reduction of the necessary amount and thrust for water pumping and thus in reduction of the electricity consumption.
- Installation of the auxiliary transformers as well as rehabilitation of transformer equipment at transformer substations will enable to reduce electricity losses. Technical characteristics are presented at the producer's website (PJSC "Uman plant "MEGOMMETR"): *http://transformatory.com.ua/.*
- Optimization of operation modes of electric power supply of pump unit drives will enable to reduce electricity consumption.
- Installation of thyristor converters of "TEP" type provides connection of an engine to the power source and disconnection from it with smooth adjustment of voltage and engine speed. The engine takes the average value of the output voltage of the converter, but not the instantaneous value due to the high switching frequency. Technical characteristics are presented at the producer website (PJSC "Zaporizhskyy Electrical Equipment Plant"): *http://www.zeaz.com.ua/*.
- Installation of capacitor units of "AKKM" type (Fig. A.5) produced by "Novotehelektro" Ltd. and the reactive power compensation units of "UKM" type produced by CF PE "Enerhospetsservis" with the «PIC-KVAR» reactive power regulators produced by PCF "Silkon-Kvar" in aimed on compensation of the reactive power of loads of three-phase electric networks consumers with corresponding reduction of electricity losses from the power grid. Technical characteristics are presented at the producer's websites that are listed in Table A.5:

Device type	Websites of producers
AKKM	http://n-tel.com.ua/product1.html
UKM	http://energospetsservis.prom.ua/product_list
PIC-KVAR	http://www.silcon-kvar.com.ua/about.htm

Table A.5. Units producer's web sites

Fig. A.5 Capacitor unit of "AKKM" type

- Installation of switching modules with vacuum circuit breakers (Figure A.6) will enable to reduce energy consumption in the power supply network, since they almost don't consume electricity from the power grid during switching on and don't consume it completely during switching off, providing besides the minimum time for switching operation. Technical characteristics are presented at the producer website ("Tavrida Electric Ukraine" company):

  http://tavrida-ua.com/products/drawout_modules_for_switchgear.html.

Fig. A.6. Switching module with vacuum circuit breakers BB/TEL-10

- Switching of coal-operating boiler-houses to the fuel with low carbon content (natural gas) with corresponding replacement of old boilers by the new ones, will enable to reduce the GHG emissions.
- Switching of boiler-houses to the renewable resources (wood) with corresponding replacement of old boilers by the new wood-fired ones, and implementation of the local heating systems will enable to eliminate the anthropogenic GHG emissions completely.
- Replacement of the obsolete boilers with low efficiency by the new highly efficient ones will result in efficiency increasing up to 90-92%. Technical characteristics of new boilers scheduled to be installed are presented at the producer's websites that are listed in Table A.6 below.

Type of boiler	**Websites of producers**
Zhytomyr P-3 KC	*http://atem.zt.ua/*
Rivneterm	*http://agroresurs.ua/uk/products/show/2*
KS-G-V	*http://kpemz.ltd.ua/kotly.html*
NIISTU	*http://am.bershad.com.ua/niistu5.html*
AOGV	*http://ross.dn.ua/*
ECO	*http://www.teplomash.com.ua/*
AOT	*http://teplogaz.com.ua/*
KO-15	*http://npo-tes.com/heating/boilers-ko-15/*

Table A.6. Boilers producer's web sites

- Rehabilitation and modernization of obsolete but able to work boilers with using various energy saving technologies, including replacement of boiler burners, replacement of heating surfaces of boilers, chemical flushing, etc., will enable to increase their efficiency.
- Heat modernization of administrative, industrial and utility buildings including insulation of walls by heat insulating materials, replacement and heat insulation of doors, gates, windows, partial replacement of roofs, additional building of tambour, replacement of single glazing by double glazing, etc., will enable to reduce heat losses and correspondently to reduce the fuel consumption for heating.
- Reduction of losses in heat network (optimization of routing, replacement and rehabilitation of pipes, sealing of control and stop valves, etc.) will enable to reduce electricity consumption for hot water pumping.
- Replacement of circulatory pumps by the modern ones in the heat system will enable to considerably reduce power consumption. Characteristics of the main technical parameters of the new pumps scheduled to be installed are presented at the producer website: *http://www.wilo.ua/*.
- Optimization of operation mode of lighting and implementation of energy efficient lighting devices will enable to reduce up to 80% of electricity consumption for lighting.
- Implementation of the alternative energy sources such as solar and wind energy generating units will enable to replace electricity from the state power grid by its own production without fuel consumption. Technical characteristics of solar modules (Fig. A.7) are presented at the producer website (PJSK "Kvazar"): *http://www.kvazar.com/*.

Fig. A.7. Solar module

- Operation mode improvement measures will enable to reduce electricity consumption:
  - realization of optimal operation modes of irrigation systems,
  - realization of optimal water levels at canals with motor water-lifting,
  - optimization of the operation modes of transformers in the autumn-winter period (disable of unused transformers) to avoid idle running losses,
  - realization of optimal operation modes of pump stations (constant operation of pump units, first-priority using of pump units with higher efficiency, etc.),
  - realization of pumping units operation in the optimal zone of pressure characteristic,
  - realization of optimal operation modes of drainage pumping system,
  - reduction of usage of resistance heating of facilities;
- Implementation of modern control, monitoring and automation systems as well as installation of modern water (ultrasonic flowmeters) and electricity (modern multiple-tariff electricity meters) measurement equipment will allow increasing efficiency of the AR Crimea water complex in general. Technical characteristics of flowmeters (Fig. A.8) are presented at the producer website (JSK "Energooblik"): *http://energo.kh.ua/rusvs/Produkcija/UVR/*

Fig. A.8. Ultrasonic flowmeter of UVR-011 type

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The main equipment of DWIs before the project start

Before the start of the project, in the water supply systems of the AR Crimea water complex and the North-Crimean canal primarily the Ukrainian and Russian made pumps were used, including ОПВ-2500-4,2, К-160/20, 300Д-70, 5А1605243, 6К-4, ВВН-1,5, А2-92-6, АМН М315, У4, 200Д60, НКМ-8, К-80-65-160, ВК 1/16, 200Д-90, Д800-57 and others. The water pipe network and canals were characterized by water losses in average at about 25%. Detailed information is presented in **Appendix 2 "Pump equipment"**.

The heat supply systems of objects of the AR Crimea water complex and the North-Crimean canal were primarily based on using of the Ukrainian and Russian made coal, fuel oil and gas fired boilers, including: E-1.0-009M, AOZhGV-23, KG-GS-20, NIISTU-5, Universal-5, etc. The efficiencies of these boilers were in the range of 62 – 85 %. Detailed information is presented in **Appendix 5 "GHG emission reduction due to reduction of fuel consumption".**

The main milestones of the project implementation are shown in the table below:

#	Project stage	Period
1	Rehabilitation and replacement of pump equipment	2004 – 2020
2	Rehabilitation of open canals	2004 – 2020
3	Cleaning of open canals, basins and water-storage reservoirs	2004 – 2020
4	Rehabilitation of networks and replacement of water supply pipes	2004 – 2020
5	Realization of operation mode improvement measures	2004 – 2020
6	Replacement of obsolete boilers with high efficient ones, switching of boiler-houses to another type of fuel, rehabilitation of boilers, reducing of losses in heat distribution networks	2004 - 2020
7	Rehabilitation of the structure facilities complex of water industry	2004 – 2020
8	Heat modernization of administrative, industrial and utility buildings	2004 - 2020
9	Implementation of modern control, monitoring and automation systems, installation of modern water and electricity measurement equipment	2007 - 2020
10	Installation of auxiliary transformers	2007 – 2020
11	Optimization of operation modes of lighting and implementation of the energy efficient lighting devices	2008 – 2020
12	Implementation of frequency regulation of pump electric drives	2011 – 2020
13	Optimization of operation modes of electric power supply of pump unit drives with installation of the reactive power compensation units, thyristor converters, switching modules with vacuum circuit breakers, etc.	2011 – 2020
14	Implementation of the alternative energy sources such as solar and wind energy generating units, etc.	2012 - 2020

Table A.7. Schedule of the Project implementation

Information on implementation of the above technologies and measures for efficiency improving as well as estimated project GHG emissions reductions are provided in **Appendices 3 – 6:**

Appendix 3. Implementation of energy saving measures.
Appendix 4. GHG emission reduction due to reduction of electricity consumption.
Appendix 5. GHG emission reduction due to reduction of fuel consumption.
Appendix 6. Total GHG emission reduction.

These technologies are already approved but some of them are not widespread. Therefore, there might be some obstacles, which are typical for the implementation of the new technologies and equipment.

These technologies are the most modern thus it is ensured that there is no risk that they will be substituted by any other technologies during at least during the second commitment period, and taking into account the overall economic situation in the country - during another two or three decades as well. Further, the project activity can be extended due to the above measures at the facilities included in the project. The detailed information about the types and amounts of project activity will be included in the periodic monitoring reports.

As far as the main activity of the departments that implement the JI project will not be changed during the project implementation, the special technical trainings for personnel are not necessary. The technical personnel of the departments have sufficient knowledge and experience for project activity implementation and regular equipment maintenance.

In cases of the new (never used at this department before) equipment installation, the company - producer of this equipment should provide trainings for personnel.

The departments that implement the project provide personnel retraining according to the labour protection norms. All DWIs have the Labour protection department, which is responsible for improving the level of personnel skills and trainings.

The special trainings on the necessary data collection in accordance with monitoring plan of the project were conducted by specialists of the Institute of Engineering Ecology for the representatives of the water complex departments involved in the project in January, 2013 (see **Annex 3 "Monitoring Plan"**).

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:

The project activity that includes measures described in section A.4.2, will increase energy efficiency of the state irrigation systems of the AR Crimea water complex and the North-Crimean canal, thus enabling them to supply the same amount of water for watering of irrigated areas and other needs, with less fuel and energy resources consumption. Reduced fuel and energy resources consumption will lead to reduction of GHG emissions.

In the absence of the proposed project, all equipment, including the obsolete low efficient but still workable one, will operate for a long life period in as-usual mode, and any emission reductions will not occur.

The relationships in the sector of drinking water and water for watering of irrigated areas supply in Ukraine are regulated by the Laws of Ukraine "On Drinking Water and Drinking Water Supply"[5] dated 10/01/2002 No. 2918-III (with changes) and "On Land Melioration" dated 14/01/2000 No. 1389-XIV[6] (with changes). Ukraine gives a great attention to the development of activities on energy saving that is pointed out in the Law of Ukraine "On energy saving" dated 01/07/1994 No. 74/94-VR[7], including in the field of water industry, which is represented in the Law of Ukraine "On the State Program for Water

[5] http://zakon2.rada.gov.ua/laws/show/2918-14
[6] http://zakon1.rada.gov.ua/laws/show/1389-14
[7] http://zakon3.rada.gov.ua/laws/show/74/94-%D0%B2%D1%80

Industry Development" dated 17/01/2002, No.2988-III[8] and in particular in the corresponding "Program for water industry of the Autonomous Republic of Crimea development for the period till 2015"[9] approved by the Resolution of the Verkhovna Rada of the AR Crimea dated 17/11/2004, No.1121-4/04a, and confirmed in the new Law of Ukraine "On Approval of the State Targeted Program for Water Industry Development and ecological improvement of the Dnipro river basin for the period till 2021" dated 24/05/2012, No.4836-VI[10]. This new regulatory document has not considerably changed the previously existing practices in the water industry sector, but more rigidly stimulates the energy saving and implementation of the higher energy efficient technologies.

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

Estimated amounts of emission reductions by years over the crediting period are presented in Tables A.8 - A.11. All values are rounded to integral number of tonnes of CO_2 equivalent.

The First Kyoto Commitment period (2008 – 2012):

	Years
Length of the crediting period	5
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2008	38 614
2009	44 670
2010	47 899
2011	52 653
2012	76 575
Total estimated emission reductions over the first commitment period (tonnes of CO_2 equivalent)	**260 411**
Annual average of estimated emission reductions over the first commitment period (tonnes CO_2 equivalent)	52 082

Table A.8. Estimated emission reductions during the first commitment period (2008 – 2012)

The Second Kyoto Commitment period (2013 – 2020):

	Years
Length of the crediting period	8
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2013	82 528
2014	88 675
2015	94 599
2016	100 520
2017	106 443
2018	112 364
2019	118 287

[8] http://zakon2.rada.gov.ua/laws/show/2988-14
[9] http://zakon3.rada.gov.ua/krym/show/rb1121002-04
[10] http://zakon2.rada.gov.ua/laws/show/4836-17

2020	124 238
Total estimated emission reduction over the second commitment period (tonnes of CO_2 equivalent)	**827 654**
Annual average of estimated emission reductions over the second commitment period (tonnes CO_2 equivalent)	103 457

Table A.9. Estimated emission reductions during the Second Kyoto Commitment period (2013 – 2020)

The Post-second Commitment period (2021 – 2040):

	Years
Length of the crediting period	20
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2021	124 238
2022	124 238
2023	124 238
2024	124 238
2025	124 238
2026	124 238
2027	124 238
2028	124 238
2029	124 238
2030	124 238
2031	124 238
2032	124 238
2033	124 238
2034	124 238
2035	124 238
2036	124 238
2037	124 238
2038	124 238
2039	124 238
2040	124 238
Total estimated emission reduction over the post- second commitment period (tonnes of CO_2 equivalent)	**2 484 760**
Annual average of estimated emission reductions over the post- second commitment period (tonnes CO_2 equivalent)	124 238

Table A.10. Estimated emission reductions during the Post- second Kyoto Commitment period (2021 – 2040)

Total amount of Emission Reductions over the crediting period:

	Years
Length of the crediting period	33
	Estimate of annual emission reductions in tonnes of CO_2 equivalent
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**3 572 825**
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	108 267

Table A.11. Estimated emission reductions during the crediting period (2008 – 2040)

A.5. Project approval by the Parties involved:

Ukrainian DFP – the State Environmental Investment Agency of Ukraine has issued the Letter of Endorsement for this project (No. 404/23/7 dated 01/02/2013).

According to the adopted procedure, the Letters of Approval by Parties involved will be issued after the project determination.

SECTION B. Baseline

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

Indication and description of the approach chosen regarding baseline setting

According to the "Guidelines for users of the JI PDD form" version 04[11], the baseline shall be established on a project-specific basis, or where applicable, project participants may opt to apply approved clean development mechanism (CDM) baseline and monitoring methodologies.

Among the approved CDM methodologies, compatible for project activities to the proposed project is the methodology AM0020 «Baseline methodology for water pumping efficiency improvements", version 02[12].

This methodology can be applied to projects, the activities of which are to reduce emissions by improving the efficiency of electric energy consumption in water pumping system, including reduction of technical losses and leakages of water as well as energy efficiency increasing of pump systems that consume electricity from the grid.

The current activity of the systems of the AR Crimea water complex and North-Crimean canal is characterized by continuous deterioration of the pump equipment with continuous decrease of its efficiency. The main energy efficiency indicator of departments of the AR Crimea water complex and the North Crimean Canal is the specific energy consumption per unit of pumped water.

The normal production activity of the water complex requires ensuring of the appropriate climatic conditions for the equipment and personnel inter alia, heating of buildings in winter time.

The project activity includes reduction of GHG emissions due to decreasing of the specific consumption and correspondingly of the amount of electricity used for water pumping in systems of the AR Crimea water complex and North-Crimean canal, as well as due to the reduction of fuel consumption for heating of buildings, under the condition of ensuring the necessary level of production activity.

Thus, the whole project activity is composed from the two complementary main parts:

- implementation of the measures, equipment and technologies for decreasing electricity consumption in processes of water pumping for its supply to customers and for watering of the irrigated lands;
- implementation of the energy saving measures, equipment and technologies for decreasing of fuel consumption that is used for heating.

The first part is the main one due to volume and expected results of activity, but both these parts should be considered and reflected in the baseline and monitoring approach applied.

Application only of the AM0020 methodology is impossible, since the formulas for previous estimation of project emission reductions include the exact values of electricity consumption and the volumes of pumped water, and in the proposed project it is impossible to specify the required amount of electricity for water pumping in the project years. In addition, the AM0020 methodology does not enable to estimate the GHG emissions from reduction of the fuel consumption for heating purposes.

Thus, there is no completely suitable methodology among the approved CDM baseline and monitoring methodologies for application in the projects of this type.

In course of development of this JI project, in accordance with paragraph 9(a) of the "Guidance on criteria for baseline setting and monitoring" (version 03)[13], the project specific approach was used, developed in accordance with appendix B "Criteria for baseline setting and monitoring" to «Guidance for

[11] http://ji.unfccc.int/Ref/Documents/Guidelines.pdf
[12] https://cdm.unfccc.int/methodologies/DB/TH0MTJC0KYJYYMQLL9B71Q9QJHOPZ9
[13] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf

the implementation of Article 6 of the Kyoto Protocol» ("JI Guidelines")[14].

This project specific approach is based on the permanent measuring of the electricity and fuel consumption and of the useful «products» of the production activity of the water industry complex departments – the total amount of pumped water.

Since the main indicator of the efficiency of pump equipment performance is the specific consumption of electricity for water pumping, namely this indicator is the main for baseline setting as well as for the following monitoring of implementation of the project activities.

Application of the approach chosen

There were three alternative versions of the Baseline scenario that were discussed before starting this project.

The first version of the Baseline scenario was a business-as-usual scenario with minimum rehabilitation works balanced by overall degradation of the systems of water pumping and watering of irrigated land and boiler equipment. In this scenario, consumption of electricity and fuel will increase. For this Baseline scenario there are no barriers (no investment barrier since this scenario doesn't require the attraction of additional investments, and no technological barrier since the equipment is operated by existing skilled personnel, and additional re-training is not required). Despite the fact that a large part of the working equipment has now exhausted its project resource, its further operation is permitted by the energy-mechanical service of departments in accordance with the legislation of Ukraine «On Drinking Water and Drinking Water Supply»[15]. This scenario represents the common practice in Ukraine, and is the most probable since the departments are able to meet the needs of consumers without implementation of the project activities.

The second version of the Baseline scenario was to make the rehabilitation without JI mechanism.

Realization of this scenario will enable to reduce energy and fuel consumption due to implementation of the project activity, and accordingly to significantly reduce the GHG emissions, but the realization of this scenario is associated with overcoming of both two barriers: investment barrier, since this scenario requires the attraction of large additional investments, and due to very large payback time and high risks it is not attractive for investors, and as well the technological barrier, since operation of the new modern equipment will require additional re-training of personnel. Rehabilitation of equipment, which is designed for water pumping and watering of irrigated lands and heating to improve its efficiency, is not a common practice in Ukraine.

The third version of the Baseline scenario was the shortened project activity, without any of the non-key type of activity, for example elimination of frequency controllers installation, etc., from the project. This makes project economically less attractive, with the longer pay back period.

None of the above alternatives are in contrary to the legislation of Ukraine.

The analysis of the above versions of the baseline shows that the most probable is the first version. Thus, the first version was chosen for Baseline scenario – the prolongation of «business-as-usual» situation.

[14] *http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf*
[15] *http://zakon2.rada.gov.ua/laws/show/2196-15*

Implementation of the project activities was started in 2004 at objects of the first departments - JI project partners. For the departments which joined the JI project later, implementation of the energy efficiency measures for modernization of water supply and heating systems was started in the year of their joining the project (see Table B.1 below).

Departments implementing the JI project	Year of joining the JI project
Krasnoperekopsk DWI	2004
Dzhankoy DWI	2004
Kirovske IDWI	2004
Lenine IDWI	2004
Nyzhnyohirskyy IDWI	2004
Rosdolne IDWI	2004
Saky IDWI	2004
Salgirske IDWI	2004
Connecting canal Department	2004
Pervomayske DWI	2005
Pobedne IDCDS	2005
Sovetskyy DWI	2005
The North-Crimean canal Department	2005
Bakhchysaray IDWI	2006
Krasnohvardiyske IDWI	2006
Tayganske IDWI	2006

Table B.1 Years of Departments' joining the JI project

Specific electricity and fuel consumption in the baseline scenario is calculated with taking into account of the fact of it increasing with time. This is caused by the step-by-step decreasing of efficiency of pump and other equipment with time.

The activity of systems of water pumping and watering of irrigated land and heat supply of objects of water complex of the AR Crimea and the North-Crimean canal is characterized by the step-by-step deterioration of the equipment operation with a long steady decline of its efficiency. According to the Resolution of the Supreme Council of the AR Crimea "On the program of water complex development of the AR Crimea till 2015" No. 1121-4/04 dated 17/11/2004[16], in comparison with 1990 the volume of water used in the Crimea decreased by 61 percent, while the volume of water losses during its transport actually has not changed, as a result of physical deterioration of inter-farm and farm irrigation networks as a whole.

For heat generating equipment (boilers) the efficiency reduction, as assessed in regulatory documents[17,18], in case of proper current technical maintenance of this equipment ranges from 0.19 (for large KVGM type boilers) to 0.44% (for majority of 0.5 – 3.15 MW boilers) per year. The Crimean WIDs for their own needs operate small boilers of 0.05 – 0.5 MW, for which the efficiency reduction is even larger. For pump equipment such reduction of efficiency is not defined in the regulations, but in accordance with the producers' long-term dates and assessments in several already determined and registered JI projects **(**"Development and improvement of water supply system, drainage system and wastewater treatment of "Infox Ltd." branch of "Infoxvodokanal"[19]**,** "Development and Improvement of Water Supply System, Drainage System and Wastewater Treatment of City Communal Enterprise "Mykolayivvodokanal""[20], etc.) it makes from 2 to 4 % per year and even more. In fact, the routine maintenance of pumping or heat generating equipment is not performed at the appropriate level in

[16] http://zakon3.rada.gov.ua/krym/show/rb1121002-04
[17] http://www.janko.front.ru/KTM_204_UKR_246_99.zip
[18] http://budstandart.ua/read/document_body/id/3091126
[19] http://www.carbonunitsregistry.gov.ua/ua/261.htm

Ukraine, and therefore it is obvious that the real decreasing of the efficiency is much more, and in general can be 1% per year for boilers and 5% per year for pumping equipment and even more. Recalculation of the information provided in the abovementioned "Resolution …" No. 1121-4/04[20] in terms of the efficiency reduction coefficient has led to its value of in average 2.7 % per year. According to the conservative approach, the baseline was constructed based on the average efficiency decreasing of the main pumping equipment at 2.5% per year, and for heat-generating equipment at 0.5% per year.

The baseline setting will be fulfilled for every year of the monitoring of the emission reductions by the project. Similar specific approach is already used in a number of JI projects ("Development and improvement of water supply system, drainage system and wastewater treatment of "Infox Ltd." branch of "Infoxvodokanal"[21],"Development and Improvement of Water Supply System, Drainage System and Wastewater Treatment of City Communal Enterprise "Mykolayivvodokanal"[22], " Rehabilitation of the Heat and Water Supply Systems in Vinnytsia Region"[22], " Rehabilitation of the Heat and Water Supply Systems in Lutsk city"[22] and other), and is the most appropriate, accurate and corresponding to the conservative approach, and in the most closely manner reflects the purpose, tasks and spirit of the Kyoto Protocol.

This project specific approach, including the formulae for baseline calculations is presented in details in **Section D.1.1.**

The following GHG emissions are included in the baseline scenario:

1) GHG emissions due to electricity production that is consumed by the objects of the AR Crimea water complex and the North-Crimean canal for transport and supply of water as well as for heating and lightning, etc.;
2) GHG emissions due to fuel consumption by objects of the AR Crimea water complex and the North-Crimean canal for heating.

The key information and data used to establish the baseline are provided in tabular form below:

Data / Parameter	W_i^b
Data unit	ths. m^3
Description	Volume of pumped water by objects of the department *i* in the base year
Time of determination/monitoring	Once after the end of the base year
Source of data (to be) used	Statistical reporting "Form #11-SN" for each Department that implements the project
Value of data applied (for ex ante calculations/determinations)	See Appendix 4
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Is measured by meters (flowmeters) or is determined based on the electricity consumption in accordance with the approved methodology (MVV 964.21-01 "Volume and volume flow of water pumped by the pump station")[22]
QA/QC procedures (to be) applied	Equipment is inspected and calibrated according to the State Standard of Ukraine No. 2708:2006 "Metrology. Calibration of measuring equipment. The organization and procedure"[23].
Any comment	Information is archived in paper form

[20] http://zakon3.rada.gov.ua/krym/show/rb1121002-04
[21] http://www.carbonunitsregistry.gov.ua/ua/261.htm
[22] *Volume and volume flow of water pumped by the pump station. The typical methodology for measurements MVV 964.21-01. – Institute of hydrotechnique and melioration. – Kyiv, 2003. – 19 p. Approved by the State Committee on energy saving, No.741-ò/3 dated 13/11/2003.*
[23] http://oscill.com/files/27082006.pdf

Data / Parameter	EC_i^b
Data unit	MWh
Description	Electricity consumption by objects of the department *i* in the base year
Time of determination/monitoring	Once after the end of the base year
Source of data (to be) used	Statistical reporting "Form #11-SN" for each Department that implements the project
Value of data applied (for ex ante calculations/determinations)	See Appendix 4
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measurement by electricity meters
QA/QC procedures (to be) applied	Equipment is inspected and calibrated according to the State Standard of Ukraine No. 2708:2006 "Metrology. Calibration of measuring equipment. The organization and procedure" [24]
Any comment	Information is archived in paper form

Data / Parameter	B_i^b
Data unit	ths. m^3 (t)
Description	Fuel consumption by objects of the department *i* in the base year
Time of determination/monitoring	Once after the end of the base year
Source of data (to be) used	Each Department that implements the project
Value of data applied (for ex ante calculations/determinations)	See Appendix 5.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measurements are taken: for natural gas by gas flow meters, for solid fuel (coal and wood) by the balance devices, for fuel oil by level in the storage tank, as well as is determined by the bills for the purchased fuel
QA/QC procedures (to be) applied	Equipment is inspected and calibrated according to the State Standard of Ukraine No.2708:2006 "Metrology. Calibration of measuring equipment. The organization and procedure"[25]
Any comment	Information is archived in paper form

Data / Parameter	NCV_i^b
Data unit	GJ/ ths. m^3 (GJ / t)
Description	Averaged net calorific value of fuel consumed by objects of the department *i* in the base year
Time of determination/monitoring	Once after the end of the base year
Source of data (to be) used	Each Department that implements the project
Value of data applied (for ex ante calculations/determinations)	See Appendix 5
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Is calculated based on Fuel Supplier's Report

[24] http://oscill.com/files/27082006.pdf

QA/QC procedures (to be) applied	N/A
Any comment	Information is archived in paper form

Calculations of emission reductions will be made for any reported year (period) with taking into account the actual conditions in that year (period) including amount of pumped water, carbon emission factors, etc., and the dynamic baseline (see Section D.1.1 and Annexes 2 and 3). Thus, carbon emission factor values for the base year are not used in further calculations and correspondingly are not referenced in Section B.1.

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:

The anthropogenic GHG emissions in the project scenario will be reduced due to modernization of the water and heat supply systems with application of the proposed project activities that are described in **paragraph A.4.2.**

Additionality of the project

The additionality of the project activity is demonstrated and assessed below with using the "Tool for the demonstration and assessment of additionality" (Version 07.0.0)[25] (see Fig. B.1). This tool was originally developed for CDM projects but may be applied to JI projects as well.

[25] *http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf*

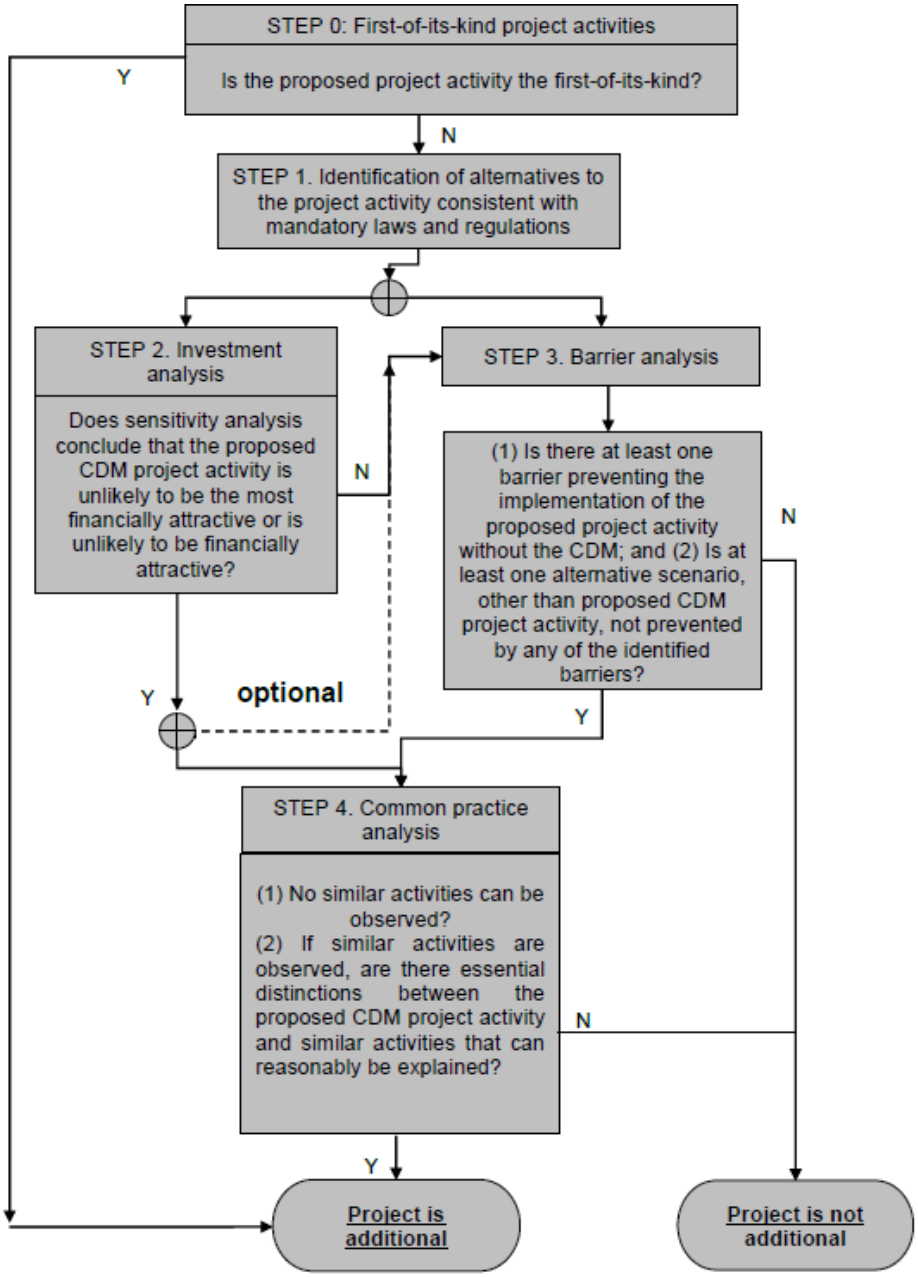

Fig.B.1. Steps for demonstration of additionality

Step 0 Demonstration whether the proposed project activity is the first-of-its-kind

At least 4 JI projects on rehabilitation of water supply systems, and over 10 JI projects on district heating systems rehabilitation are already published[26], in which the similar project activities are applied.

Hence, the Step 0 is not satisfied.

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

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

There are three alternatives to this project (as was already discussed in section **B1**).

1. The first alternative is continuation of the current situation (no project activity or other alternatives undertaken), i.e. business-as-usual scenario with minimum rehabilitation works, approximately balanced by overall degradation of the water supply and watering of the irrigated lands and heating systems.

It should be noted that, for example, there is no Ukrainian legislation regarding the maximum operation lifetime and replacement for water supply networks, canals, pumps and boilers. It is common practice in Ukraine to operate objects and equipment which were installed in 70th and even in 50-60th, if they are operationable, and for the objects of increased danger as boilers, if they pass the technical examination by the authorized body ("Derzhnagliadohoronpratsi").

2. The second alternative is to make rehabilitation works (the proposed project activity) without JI mechanism.

3. The third alternative is the shortened project activity, without any of the non-key type of activity, for example elimination of frequency controllers implementation, etc., from the project.

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

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

The main laws and regulations in this sector at the present time are the Laws of Ukraine "On Drinking Water and Drinking Water Supply" [27] dated 10/01/2002 No. 2918-III (with changes), "On Land Melioration" dated 14/01/2000 No. 1389-XIV[28] (with changes), "On energy saving" dated 01/07/1994 No. 74/94-VR[29], "On the State Program for Water Industry Development" dated 17/01/2002 No.2988-III[30], "On Approval of the State Targeted Program for Water Industry Development and Ecological Improvement of the Dnipro River Basin for the Period till 2021" dated 24/05/2012 No.4836-VI[31].

None of these regulatory documents obliges a Department of water industry to realize modernization of its production equipment. Thus, according to the Law "On Drinking Water and Drinking Water Supply", a department is obliged only to maintain the system in operation condition and prevent accidents that can occur. The current practice of detection and elimination of water leakages is corresponding to all applicable laws and regulations of Ukraine.

Thus, all alternative scenarios correspond to the main legislation in this sector.

Outcome of Step 1b: The alternatives, which are: to continue business-as-usual scenario, to make rehabilitation works without JI mechanism and to implement shortened project activity without any of the non-key type of project activity, are in compliance with the mandatory laws and regulations.

Hence, the Step 1 is satisfied.

[26] http://www.carbonunitsregistry.gov.ua/ua/261.htm
[27] http://zakon2.rada.gov.ua/laws/show/2918-14
[28] http://zakon1.rada.gov.ua/laws/show/1389-14
[29] http://zakon3.rada.gov.ua/laws/show/74/94-%D0%B2%D1%80
[30] http://zakon2.rada.gov.ua/laws/show/2988-14
[31] http://zakon2.rada.gov.ua/laws/show/4836-17

According to the "Tool for the demonstration and assessment of additionality" (Version 07.0.0)[32], for further additionality analysis it is possible to follow the Step 2 or Step 3 (or both).

Step 2. Investment analysis

Sub-step 2a: Determine appropriate analysis method

The appropriate analysis method is to be chosen in dependence of generating of financial or economic benefits by the project. If project activity generates no financial or economic benefits other than JI related income, then the simple cost analysis (Option I) may be applied, otherwise the investment comparison analysis (Option II) or the benchmark analysis (Option III) should be used.

The Departments of the AR Crimea water complex and the North-Crimean canal (DWIs) are the budgetary non-profit organizations. DWIs provide water supply services for watering of irrigated or humidification of drained lands according to the Decree of Cabinet of Ministers of Ukraine dated 26.10.2011 №1101 "On confirmation of list of paid services which are provided by budgetary organizations that belongs to the scope of management of the State Water Resources Agency".[33]

The cost of the water supply services is set in accordance with the order of the State Committee for the water industry of Ukraine, Ministry of finance of Ukraine, Ministry of economy of Ukraine dated 27.03.2009 № 61/482/273 «On making changes to the Order of rendering of paid services by budgetary establishments and organizations which belong to the scope of management of the State Committee for the water industry of Ukraine, by order of legal entities and individuals" [34].

Received costs for providing paid services are transferred to the special fund of the State budget of Ukraine and are used in accordance with the approved cost estimation of a water industry organization in amount which is calculated as the difference between normative needs of costs from the general fund for water supply to final water point, and actually provided allocations for these purposes in the state budget.

Thus, the water industry organization does not receive any additional revenue from reduction of fuel and electricity consumption.

Outcome of Sub-step 2a: In accordance with above mentioned, the simple cost analysis (Option I) may be applied.

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

Implementation of the project activity will require substantial additional investments – about 62 million EUR only for the main equipment installation / rehabilitation / modernization. The required investments for implementation of the project include the costs of the main equipment installation / rehabilitation, as well as the auxiliary costs such as personnel training, maintenance control, systematic data collection and archiving, etc.

Estimated costs for implementation of the defined above alternatives to the project activity:

1. For the first alternative (continuation of the current situation, business-as-usual scenario) no additional investments are required.

2. For the second alternative (the proposed project activity without JI mechanism) the required additional investments are the same as for the project activity.

3. For the third alternative (shortened project activity) the required additional investments are less then the ones required for the project activity.

Outcome of Step 2: There is at least one alternative which is less costly than the project activity.

Hence, the Step 2 is satisfied.

[32] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf
[33] http://zakon2.rada.gov.ua/laws/show/1101-2011-%D0%BF
[34] http://zakon3.rada.gov.ua/laws/show/z0344-09

Step 3: Barrier analysis

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

Identification and analysis of barriers are executed in accordance with the "Guidelines for objective demonstration and assessment of barriers" [35].

Investment barriers

The Departments of the AR Crimea water complex belong to the management scope of the Republic Committee on water industry construction and irrigated agriculture of the AR Crimea (Reskomvodhosp). The Republic Committee on water industry construction and irrigated agriculture of the AR Crimea and the Department of the North-Crimean canal are answerable to the State Agency of Water Resources of Ukraine on execution of state function and authorities.[36]

The property in disposal of departments of the AR Crimea water complex and the North-Crimean canal is 100% state-owned.

The general situation in the sector of water supply and watering of irrigated lands in the AR Crimea may be characterized by significant deterioration of pumping and engineering equipment of water supply systems, large losses of water and costs deficit[37].

Since the source of financing for this project activity is the state budget of Ukraine, this project can not be considered as commercially profitable activity.

In addition, in accordance with common practice the total electricity consumption is relied on the end-consumers of specified services, so departments of water complex have no incentive to improve the efficiency of the equipment.

The JI mechanism will enable to obtain the additional funds for financing the project implementation, thereby to accelerate its realization.

From the other side, the additional financing of the project activity from JI mechanism is not only important for project financing, but also is a very positive factor that even can allow shifting the priorities of budget financing, thus decreasing the investment barrier.

Technological barriers

1. Not all proposed technologies are widely spread already. Qualification of operational personal for implementation of the new technologies may be not sufficient to provide project implementation properly and in time.

Most of departments of the AR Crimea water complex and the North-Crimean canal fulfill annual minimal repairing of the water supply and watering of irrigated land systems as well as heat supply systems to keep them working. Particularly they execute repairing of network's parts and boilers that might cause accidents. The most economically feasible and realistic scenario without carbon credits sales is a very slow rehabilitation activity, instead of making a major overhaul.

2. Efficiency of installed equipment could be lower than it was claimed by producers, or equipment may have substantial defects.

[35] *http://cdm.unfccc.int/EB/050/eb50_repan13.pdf*

[36] *http://www.vodhoz.crimea.ua/o-komitete/polozhenie-o-respublikanskom-komitete-avtonomnoy-respubliki-krim-po-vodochozyaystvennomu-stroitelstvu-i-oroshaemomu-zemledeliiu*

[37] *http://zakon3.rada.gov.ua/krym/show/rb1121002-04*

Organizational barriers

The management experience in implementation of JI projects is absent, including international collaboration, determination, verification, registration, monitoring and so on.

Outcome of Step 3a: Identified barriers would prevent the implementation of the proposed project activity as well as of the other alternatives - to make rehabilitation works without JI mechanism and to realize shortened project activity without any of the non-key type of project activity.

Sub-step 3b: Explanation that the identified barriers would not prevent the implementation of at least one of the alternatives

One of the alternatives is to continue business-as-usual scenario. Therefore, as the barriers mentioned above are directly related to investing into modernization of systems of water supply and watering of irrigated land as well as heat supply systems in Departments that implement the project, there is no impediment for enterprises that implement the project to operate the heat and water supply systems at their present level.

Outcome of Step 3b: The identified barriers would not prevent the implementation of at least one of the alternatives – the business-as-usual scenario.

Hence, the Step 3 is satisfied.

Step 4: Common practice analysis

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

The common practice for departments of the AR Crimea water complex and the North-Crimean canal without JI mechanism is only a necessary repair of the old equipment, mainly in emergency cases, and not the renewal. Only with the JI component it is possible to obtain the necessary additional funds for real modernization of systems of water supply and watering of irrigated land as well as of the heat supply systems.

This is confirmed by the present situation that the real comprehensive modernization of water supply systems as well as of heat supply systems is performed only by the departments participating in JI projects (see Section **B.1** and **Step 0**).

But the activities in the frame of the JI projects are not to be included into the analysis of common practice.

Lack of financial incentives, according to Step 2, and the presence of barriers, according to Step 3, concerns not only the organizations of the AR Crimea water complex and the North-Crimean canal. In accordance with common practice, the total electricity consumption is relied onto the end-consumers of supplied water (enterprises and agricultural organizations of the AR Crimea), so for the departments involved in water supply in the AR Crimea, is no incentive to implement projects on energy efficiency increasing.

This situation is typical for water organizations in Ukraine. Thus, the common practice of equipment maintenance in working condition, represented in a variant of "business as usual" activities for this project, is a common and normal for Ukraine.

Outcome of Step 4a: Since no similar projects in this sector (being implemented without JI mechanism, since the projects implemented with JI mechanism are not to be taken into account) are not observed in the region, there is no basis for analysis of similar activities.

Sub-step 4b. Discuss any similar Options that are occurring

All projects on rehabilitation of water supply and watering of irrigated land systems as well as of heat

supply systems in Ukraine are being implemented only within the framework of the Kyoto Protocol JI mechanism. In the absence of additional financing (such as grants, other non-commercial finance terms, carbon credits, etc.) implementation of these projects would be impossible. Application of the JI mechanism is the only incentive to implement such projects.

Outcome of Step 4b: Activities similar to this Project are not widespread in the water industry sector in Ukraine and are not a common practice.

Thus, the Project activities do not fall under the category of *common practice.*

Hence, the Step 4 is satisfied.

Conclusion

The results of the above assessment lead to the conclusion that the project activity is additional.

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

Boundaries for the **Baseline scenario** are represented by dotted line at the graphical representation (Fig. B.2).

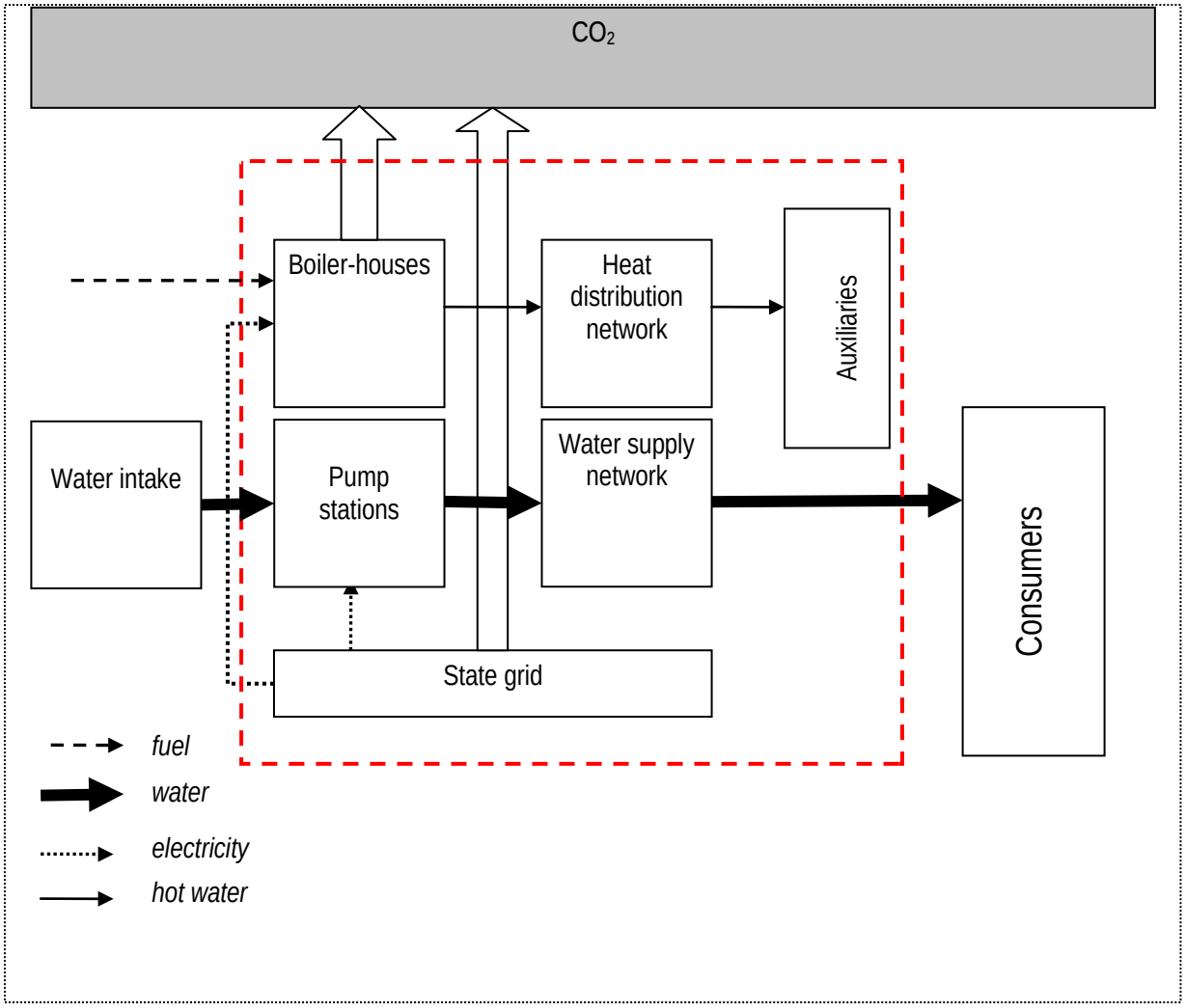

Fig. B.2. Project boundaries for the Baseline scenario

Project boundaries for the **Project scenario** are represented by dotted line at the graphical representation (Fig. B.3).

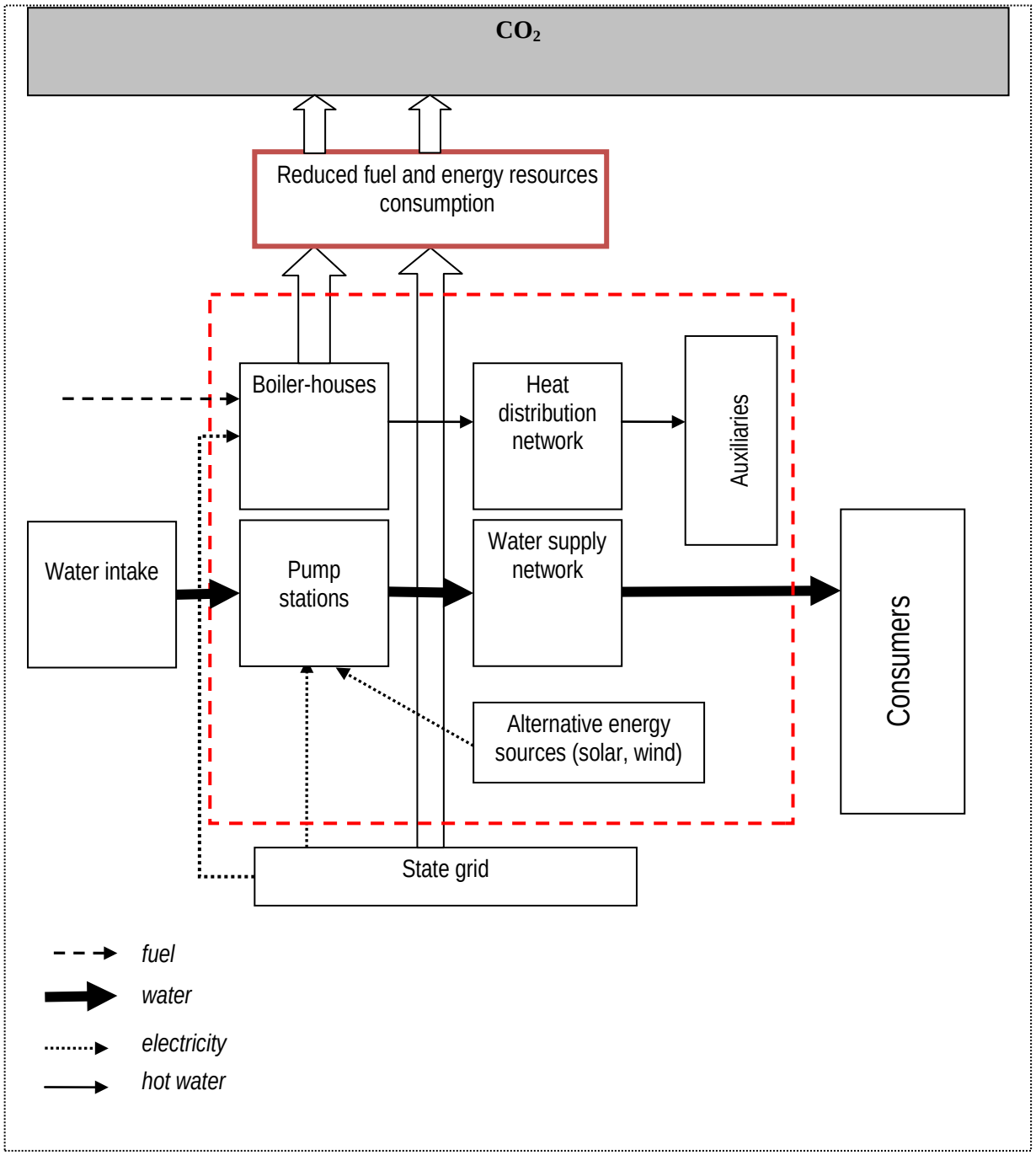

Fig. B.3. Project boundaries for the Project scenario

Direct and Indirect Emissions

Direct on-site emissions: CO_2 as well as NO_x and CO emissions from fuel combustion.

CH_4 and N_2O emissions from fuel combustion are negligible minor sources, and are excluded from considerations for simplification.

Direct off-site emissions: GHG emissions from power plants due to electricity production to the grid that is consumed by objects of departments that are involved into the project.

Indirect on-site emissions: none.

Indirect off-site emissions: CO_2 emissions from fuel extraction and transportation.

The emissions for baseline and project scenarios are presented in Table. B.2, along with explanations of what emissions are included / not included in the project boundaries.

On-site emissions			
Current situation	Project	Direct or indirect	Included or excluded
CO_2 emissions from fuel combustion	Reduced CO_2 emissions from fuel combustion due to decreasing of fuel consumption by the heat supply system	Direct	Included
NO_x and CO emission from fuel combustion	Reduced NO_x and CO emissions from fuel combustion due to decreasing of fuel consumption by the heat supply system	Direct	Excluded. NO_x and CO are not GHGs
Off-site emissions			
Current situation	Project	Direct or indirect	Included or excluded
CO_2 emissions from power plants due to electricity production to the grid, that is consumed by objects of departments involved into the project.	Reduced CO_2 emissions from power plants due to reduction of electricity consumption by objects of departments involved into the project.	Direct	Included
NO_x and CO emissions from power plants due to electricity production to the grid, that is consumed by objects of departments involved into the project.	Reduced NO_x and CO emissions from power plants due to reduction of electricity consumption by objects of departments involved into the project	Direct	Excluded, NO_x and CO are not GHGs
CO_2 emissions from fuel extraction and transportation	Reduced CO_2 emissions from fuel extraction and transportation due to fuel saving	Indirect	Excluded, not under control of project participants

Table B.2. Emissions for baseline and project scenarios

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 setting: 21/02/2013.

The baseline is determined by the Institute of Engineering Ecology, Ltd., the project developer (is not the project participant), and Krasnoperekopsk DWI, project participant and project supplier listed in Annex 1.

Institute of Engineering Ecology, Ltd.:
Kyiv city, Ukraine.
Dmytro Paderno,
Deputy director.
Phone: (+38 044) 453 28 62
Fax: (+38 044) 456 92 62
e-mail: office@engecology.com

Krasnoperekopsk DWI:
Krasnoperekopsk town, AR Crimea, Ukraine.
Vladyslav Maslianyk,
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Fax: (+38 06565) 2 11 21
e-mail: kuvh2006@mail.ru

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

The starting date of the project is: 20/04/2004.

The date 20/04/2004 was accepted as the starting date of the project in accordance to the date of adoption of the decision on starting of development and realization of the Joint Implementation project in accordance with flexible mechanisms of Kyoto protocol at the objects of Republic Committee on water industry of the AR Crimea (Protocol of Technical council meeting of Republic Committee on water industry of the AR Crimea dated 16/04/2004, adopted 20/04/2004).

C.2. Expected operational lifetime of the project:

The nominal lifetime of the new equipment such as boilers and industrial pumps is at least 20 years; the real average lifetime of the new equipment is estimated to be up to 30 – 40 years. Therefore the expected operational lifetime of the project may be at least 30 years. For further calculations the end of the operational lifetime for the project is assumed equal to 20 years, or 240 months, since implementation of the last project activity (31/12/2020).

Thus, the expected operational lifetime of the project is 36 years and 8 months (440 months), from 01/05/2004 till 31/12/2040.

C.3. Length of the crediting period:

The starting date of the crediting period is accepted as the date of the Kyoto Protocol first commitment period start that is January 1, 2008, and will continue throughout the whole project operational lifetime.

Earning of the ERUs corresponds to the first commitment period (January, 1, 2008 – December, 31, 2012) and to the second commitment period (January, 1, 2013 – December, 31, 2020), and is 13 years (156 months).

The status of emissions reduction generated by the JI projects after ending of the second commitment period within Kyoto Protocol may be defined as per relevant agreements and procedures within the framework of UNFCCC and Host country.

Thus the length of the crediting period is 13 years (156 months), from 01/01/2008 till 31/12/2020.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

For monitoring plan for the project activity, which involves implementation of measures, equipment and technology to reduce energy consumption for pumping of water mainly intended for water supply and watering of irrigated lands, in accordance with paragraph 9 (a) of the "Guidance on criteria for baseline setting and monitoring"[38], the specific approach was used, developed in accordance with annex B of "Criteria for baseline setting and monitoring"[39] to the JI guidelines, with elements of the approved methodology AM0020 "Baseline methodology for water pumping efficiency improvements" and "Monitoring methodology for water pumping efficiency improvements" (version 02) [40].

The monitoring plan, accepted for this JI project, has as its purpose to ensure the availability of all data necessary for determining the amount of emissions in the baseline and project scenarios, and therefore - the amount of emission reductions through realization of the JI project.

The monitoring plan provides measurements of the amounts of consumed electricity and pumped water, as well as fuel consumption for heat production during the year (reported period). Other parameters are obtained by calculation or in accordance with normative data.

Collection of all the key parameters necessary for calculation the GHG emissions is conducted in accordance with practice, established in organizations of water complex of the AR Crimea and the North-Crimean canal to determine the amounts of consumed electricity, pumped water and consumed fuel, as well as the impact on the environment. The project monitoring does not require changes to the existing data collection and accounting system. All relevant data are defined, calculated and recorded in process of monitoring of the usual activities. All possible leakages were considered and analyzed by using a conservative approach, and adopted as unimportant (see Section E.2). The data of monitoring plan implementation must be archived for at least 2 years after the finishing of the crediting period.

Detailed theoretical description of the approach chosen regarding monitoring is provided below.

If expected monitored data for an object of the project activity in any project period are unavailable:

- for statistical data unavailable, the default values from IPCC reports will be taken;
- for non-statistical data unavailable, the calculations for this object in this period will not be made, in according to conservative approach the estimated emission reductions for this object in this period will be assumed equal to 0.

[38] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf

[39] http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=2

[40] http://cdm.unfccc.int/methodologies/documentation/meth_booklet.pdf#AM0020

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

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

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1	Volume of pumped water by objects of the department *i* in a reported year *y* **(W_i^r)**	Statistical reporting of department, Form #11-SN	ths m^3	m, c	Once per year (reported period)	100%	Electronic and paper	Measured regularly with archiving quarterly and yearly
2	Electricity consumption by objects of the department *i* in a reported year *y* **(EC_i^r)**	Statistical reporting of department, Form #11-SN	MWh	m, c	Once per year (reported period)	100%	Electronic and paper	Measured regularly with archiving quarterly and yearly
3	Fuel consumption by objects of the department *i* in a reported year *y* **(B_i^r)**	Reporting of department, journal at a boiler-house	ths m^3 (t)	m	Once per year (reported period)	100%	Electronic and paper	Measured regularly with archiving yearly
4	Averaged net calorific value of fuel consumed by objects of the department *i* in a	Reporting of department, journal at a boiler-house	GJ/ ths m^3 (GJ / t)	c	Once per year (reported period)	100%	Electronic and paper	Calculated based on information from the fuel supplier

	reported year *y* **(NCV_i^r)**							
5	Carbon emission factors in a reported year *y* for:	Normative documents		c	Once per year (reported period)	100%	Electronic	See Annex 3
5.1	Fuels: **($EF_{CO2,F,y}$)**							Calculated based on the data from the "National inventory of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine in 1990 – 2010"
	Natural gas **($EF_{CO2,NG,y}$)**		t CO_2/GJ					
	Coal **($EF_{CO2,coal,y}$)**		t CO_2/GJ					
	Fuel oil **($EF_{CO2,fo,y}$)**		t CO_2/GJ					
5.2	Electricity consumption **($EF_{CO2,ELEC,cons,y}$)**		t CO_2e/MWh					Orders of the NEIA of Ukraine

All the data in Table D.1.1.1 above are monitored throughout the whole crediting period.

According to valid legislation[41], all measuring equipment in Ukraine should meet the specified requirements of corresponding standards and is subject to the periodical calibration.

In case of failure of measurement equipment, it should be replaced or repaired as soon as possible. Such cases should be noted in monitoring reports.

[41] http://oscill.com/files/27082006.pdf

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

GHG emissions in the reported year for the project scenario consist of the following components:

$$PE = E_w^r + E_f^r, \quad \text{(D.1.1.2-1)}$$

where:

E_w^r – emissions due to production of electricity that is consumed by the objects of the AR Crimea water complex and the North-Crimean canal departments in the reported year *y*, t CO_2e;

E_f^r – emissions due to fuel combustion by the objects of the AR Crimea water complex and the North-Crimean canal departments in the reported year *y*, t CO_2e;

[*r*] – index related to the reported year.

GHG emissions due to electricity consumption by objects of the AR Crimea water complex and the North-Crimean canal departments in the reported year *y* for the project scenario are sums taken over all departments *i* which are included into the project.

$$E_w^r = \sum_i (EC_i^r * EF_{CO2,ELEC,cons,y}), \quad \text{(D.1.1.2-2)}$$

where:

EC_i^r – electricity consumption by the objects of the department *i* in the reported year *y*, MWh;

$EF_{CO2,ELEC,cons,y}$ – carbon emission factor for electricity consumption in the reported year *y*, tCO_2e/MWh;

[*i*] – department of the AR Crimea water complex and the North-Crimean canal;

[*r*] – index related to the reported year.

GHG emissions due to fuel combustion by the objects of the AR Crimea water complex and the North-Crimean canal departments in the reported year *y* for the project scenario are sums taken over all departments *i*,which are included into the project.

$$E_f^r = \sum_i (B_i^r * NCV_i^r * EF_{CO2,F,y}), \quad \text{(D.1.1.2-3)}$$

where:

B_i^r – fuel consumption by the objects of the department *i* in the reported year *y*, ths m^3 (t);

NCV_i^r – averaged net calorific value of fuel consumed by objects of the department *i* in the reported year *y*, MJ/ ths m^3(GJ / t);

$EF_{CO2,F,y}$ – carbon emission factor for fuel in the reported year *y*, t CO_2/GJ;

[*i*] – department of the AR Crimea water complex and the North-Crimean canal;

[*r*] – index related to the reported 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:								
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
1	Volume of pumped water by objects of the department *i* in the base year **(W_i^b)**	Statistical reporting of department, Form #11-SN	ths m^3	m	Once after the end of the base year	100%	Registered in the journal (paper)	
2	Electricity consumption by objects of the department *i* in the base year **(EC_i^b)**	Statistical reporting of department, Form #11-SN	MWh	m	Once after the end of the base year	100%	Registered in the journal (paper)	
3	Dynamic specific electricity consumption by objects of the department *i* in reported year *y* in terms of the baseline scenario **(SEC_i^d)**		MWh / ths m^3	c	Once after the end of the base year	100%		The main baseline parameter calculated with using $\mathbf{W}_i^b$ and $\mathbf{EC}_i^b$

4	Fuel consumption by objects of the department *i* in the base year **(B_i^b)**	Reporting of department, journal at boiler-house	ths m^3 (t)	m	Once after the end of the base year	100%	Registered in the journal (paper)	
5	Averaged net calorific value of fuel consumed by objects of the department *i* in the base year **(NCV_i^b)**	Reporting of department, journal at boiler-house	GJ/ ths m^3 (GJ / t)	c	Once after the end of the base year	100%	Electronic and paper	Calculated based on information from the fuel supplier

For the base year (for each department) all parameters presented in Table D.1.1.3 above are determined only once after the end of the base year and thus remain fixed throughout the crediting period. These data are available already at the stage of determination.

See **Annex 3** for details.

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

GHG emissions in the reported year for the dynamic baseline scenario consist of the following components:

$$BE = E_w^b + E_f^b; \quad \text{(D.1.1.4-1)}$$

where:

E_w^b – GHG emissions due to production of electricity that is consumed by objects of the AR Crimea water complex and the North-Crimean canal in the reported year *y* in terms of the baseline scenario, t CO_2e;

E_f^b GHG emissions due to fuel combustion by objects of the AR Crimea water complex and the North-Crimean canal in the reported year y in terms of the baseline scenario, t CO_2e.

GHG emissions due to electricity consumption by objects of the AR Crimea water complex and the North-Crimean canal departments in the reported year *y* in terms of the baseline scenario are the sum taken over all departments *i* which are included into the project.

$$E_w^b = \sum_i (W_i^r * SEC_i^d * EF_{CO2,ELEC,cons,y}), \quad \text{(D.1.1.4-2)}$$

where:

W_i^r – volume of pumped water by objects of the department *i* in reported year *y*, ths m^3;

SEC_i^d – dynamic specific electricity consumption by objects of the department *i* in reported year *y* in terms of the baseline scenario, MWh / ths m^3;

$EF_{CO2,ELEC,cons,y}$ – carbon emission factor for electricity consumption in the reported year *y*, tCO_2e/MWh;

[*i*] – department of the AR Crimea water complex and the North-Crimean canal;
[*r*] – index related to the reported year;
[*b*] – index related to the base year.

For each department;

$$SEC_i^d = SEC_i^b * (1 + K_{dw} * \tau), \quad \text{(D.1.1.4-3)}$$

where:

SEC_i^b – specific electricity consumption by objects of the department *i* in the base year, MWh / ths m^3;

K_{dw} – factor of the average deterioration of the pump equipment efficiency, $year^{-1}$.

As it was described in Section B.1, the baseline GHG emissions due to electricity consumption by objects of the water complex departments are determined with taking into account the average deterioration of the main pump equipment. The factor of the average deterioration of the pump equipment efficiency K_{dw} is adopted at the level of 2.5% per year ($K_{dw} = 0.025\ year^{-1}$).

τ – duration of operation of the equipment after the base year, years.

$$SEC_i^b = EC_i^b / W_i^b \qquad \text{(D.1.1.4-4)}$$

where:

EC_i^b – electricity consumption by objects of the department *i* in the base year , MWh;

W_i^b – volume of pumped water by objects of the department *i* in the base year, ths m^3.

GHG emissions due to fuel consumption by objects of the AR Crimea water complex and the North-Crimean canal departments in the reported year *y* in terms of the baseline scenario are the sum taken over all departments *i* which are included into the project.

$$E_f^b = \sum_i [NCV_i^b * EF_{CO2,F} * B_i^b * K_1 * (1 + K_{df} * \tau)], \qquad \text{(D.1.1.4-5)}$$

where:

B_i^b – amount of a fuel consumed by objects of the department *i* in the base year, ths m^3 (t);

NCV_i^b – averaged net calorific value of a fuel consumed by objects of the department *i* in the base year, GJ/ ths m^3(GJ / t);

$EF_{CO2,F}$ – carbon emission factor for a fuel, t CO_2/GJ;

K_1 – net calorific value of a fuel change factor;

$$K_1 = NCV_i^b / NCV_i^r, \qquad \text{(D.1.1.4-6)}$$

where:

NCV_i^b – averaged net calorific value of a fuel consumed by objects of the department *i* in the base year, GJ/ ths m^3 (GJ / t);

NCV_i^r – averaged net calorific value of a fuel consumed by objects of the department *i* in the reported year, GJ/ ths m^3 (GJ / t);

K_{df} – factor of the average deterioration of the main boiler equipment efficiency, $year^{-1}$.

As it was described in Section B1, the baseline GHG emissions due to fuel consumption by objects of the AR Crimea water complex and the North-Crimean canal departments are determined with taking into account the average deterioration of the main heat generating equipment. The factor of the average deterioration of the main boiler equipment efficiency K_{df} is adopted at the level of 0.5% per year (K_{df} = 0.005 year^{-1}).

τ – duration of operation of the equipment after the base year, years.

The amounts of fuel consumption by the objects of all departments of water complex are small, the general emission reductions due to fuel consumption reduction are less than 1250 tons of CO_2 per year, and the corresponding changes of the parameter of the amount of fuel consumed B_i^b as a result of adjustment with using the adjustment factor K_1 and the changes of total emission reductions are very small; thus for this project for simplification K_1 = 1 is taken, which is conservative assumption.

Thus, the formula (D.1.1.4-5) turns to the form:

$$E_f^b = \sum_i [NCV_i^b * EF_{CO2,F} * B_i^b * (1 + K_{df} * \tau)], \qquad \text{(D.1.1.4-5')}$$

Detailed information is provided in Appendices 4 and 5 (Microsoft Office Excel tables).

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

This section is left blank for purpose. Option 1 is chosen.

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):

This section is left blank for purpose. Option 1 is chosen.

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

No leakage is expected.

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.

Any occasional leakage emissions should be eliminated as soon as possible.

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):

Estimated emission reductions for the project activity in a reported year *y*:

$$ER_y = BE_y - PE_y \quad \text{(D.1.4-1)}$$

where:

ER_y - GHG emission reductions in a reported year *y*, t CO_2e;
BE_y - dynamic baseline emissions due to electricity consumption and fossil fuel combustion that would be in a reported year *y*, t CO_2e;
PE_y - project emissions due to electricity consumption and fossil fuel combustion in a reported year *y*, t CO_2e;
[*y*] - reported year.

Formulae presented in sections D.1.1 - D.1.4 are used for estimation of emission reductions in PDD for years when values of all parameters are already available, that is for the past years.

The same formulae will be used for monitoring of the project activity results and achieved actual emission reductions in course of development of Monitoring reports during the project crediting period.

To predict in PDD the actual values of emission reductions for future years is impossible because there are no data on some necessary parameters (electricity and fuel consumption, volume of pumped water, etc.) available yet. That is why emission reductions for future years are estimated assuming that project activity level would be the same as in 2012 and with dynamic baseline assumption.

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:

According to the common Ukrainian practice for such type projects, the environmental impact of the project will be estimated by electricity consumption and fuel combustion.

- Law of Ukraine "On environmental protection" No. 1264-XII dated 25/06/1991[42];
- Law of Ukraine "On atmospheric air protection" No. 2707-XII dated 16/10/1992[43];
- Valid rules on emissions limitation: "Norms of limit admissible emissions of pollution agents from stationary sources" – adopted by Ministry for Environmental Protection of Ukraine on 27/06/2006, No.309 and registered by Ministry of Justice of Ukraine on 01/09/2006, No. 912/12786[44].

Krasnoperekopsk DWI will systematically collect data on pollution, which may cause the negative impact on the environment. Monitoring, meters (electricity, flow) data collection and archiving will be performed by qualified employers of Krasnoperekopsk DWI and other departments - the project partners.

All data must be kept for at least two years after the last transaction of ERUs generated by the project.

[42] *http://zakon2.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1264-12*

[43] *http://zakon2.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=2707-12*

[44] *http://zakon2.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=z0912-06*

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.
D.1.1.1 – 1; D.1.1.3 – 1: Volume of pumped water by objects of the department *i* **(W_i^r, W_i^b)**	Low	Measuring instruments must be calibrated according to national regulations
D.1.1.1 - 2; D.1.1.3 – 2: Electricity consumption by objects of the department *i* **(EC_i^r, EC_i^b)**	Low	Measuring instruments must be calibrated according to national regulations
D.1.1.1 - 3; D.1.1.3 – 4: Fuel consumption by objects of the department *i* **(B_i^r, B_i^b)**	Low	Measuring instruments must be calibrated according to national regulations
D.1.1.1 – 4: Averaged net calorific value of fuel consumed by objects of the department *i* **(NCV_i^r, NCV_i^b)**	Low	Calculated based on information from the fuel supplier. QA/QC procedures are not necessary.
D.1.1.1 – 5: Carbon emission factors in the reported year **($EF_{CO2,F,y}$),** **($EF_{CO2,ELEC,y}$)**	Low	Data according to the normative documents. No QA/QC procedures are necessary

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

The scheme of the operational and management structure that the project operator will apply in implementing the monitoring plan, with identification of the responsibilities and the authority regarding the monitoring activity as to the parameters to be monitored is presented in **Annex 3**.

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

The monitoring plan is determined by the Institute of Engineering Ecology, Ltd., the project developer (is not the project participant), and Krasnoperekopsk DWI, project participant and project supplier listed in Annex 1.

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SECTION E. Estimation of greenhouse gas emission reductions

Estimation (calculation) of GHG emission reductions for years when values of all parameters are already available, that is for the past years from 2008 to 2012, is based on the actual data according to the monitoring plan with using the formulae presented in **sections D.1.1 - D.1.4.**

Emission reductions for 2013-2020 are estimated in assumptions of the project executors' activity level, which is determined by volume of pumped water, at actual level in 2012, and dynamic baseline (see **sections B and D**).

Emission reductions for 2021-2040 are conservatively estimated as equal to the estimated data for the 2020.

All values in Section E tables are rounded to integral number of tonnes of CO2 equivalent.

E.1. Estimated project emissions:

The following GHG emissions are included in the project scenario:

1) GHG emissions due to production of electricity that is consumed by the objects of the AR Crimea water complex and the North-Crimean canal in the reported year *y* (E^{r}_{w}).
2) GHG emissions due to fuel consumption by the objects of the AR Crimea water complex and the North-Crimean canal in the reported year *y* (E^{r}_{f}).

Results of the calculations made with using of formulae presented in **sections D.1.1 - D.1.4**, as well as prognostic estimations are provided in **Appendixes 4 - 6.**

Project GHG Emissions are shown in Tables E.1 – E.4.

Year	Project emissions (t CO_2 equivalent)
2008	180 179
2009	162 543
2010	165 744
2011	162 029
2012	210 797
Total 2008 – 2012 (tonnes of CO_2 equivalent)	**881 292**

Table E.1. Estimated Project Emissions during the first commitment period (2008 – 2012)

Year	Project emissions (t CO_2 equivalent)
2013	210 797
2014	210 543
2015	210 543
2016	210 543
2017	210 543
2018	210 543
2019	210 543
2020	210 543
Total 2013 – 2020 (tonnes of CO_2 equivalent)	**1 684 598**

Table E.2. Estimated Project Emissions during the second commitment period (2013 – 2020)

Year	Project emissions (t CO_2 equivalent)
2021	210 543
2022	210 543
2023	210 543
2024	210 543
2025	210 543
2026	210 543
2027	210 543
2028	210 543
2029	210 543
2030	210 543
2031	210 543
2032	210 543
2033	210 543
2034	210 543
2035	210 543
2036	210 543
2037	210 543
2038	210 543
2039	210 543
2040	210 543
Total 2021 – 2040 (tonnes of CO_2 equivalent)	**4 210 860**

Table E.3. Estimated Project Emissions during period 01/01/2021 – 31/12/2040

Year	Project emissions (t CO_2 equivalent)
Total 2008 – 2040 (tonnes of CO_2 equivalent)	**6 776 750**

Table E.4. Total estimated Project Emissions during the crediting period 01/01/2008 – 31/12/2040

For detailed information see **Sections D.1.1. - D.1.4** and **Appendixes 4 - 6**.

E.2. Estimated leakage:

No leakage is expected in proposed project activity.

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

As no leakage is expected in proposed project activity, the sum of E.1. and E.2. is the same that is provided in E.1. (see Tables E.1 – E.4 above).

E.4. Estimated baseline emissions:

The following GHG emissions are included in the baseline scenario:

1) emissions due to electricity production that would be consumed by the objects of the AR Crimea water complex and the North-Crimean canal in the reported year in terms of baseline scenario (E_w^b).

2) emissions due to fuel consumption that would be consumed by the objects of the AR Crimea water complex and the North-Crimean canal in the reported year in terms of baseline scenario (E_f^b).

Baseline GHG emissions are presented in Tables E.5 – E.8.

Year	Baseline emissions (t CO_2 equivalent)
2008	218 793
2009	207 213
2010	213 643
2011	214 682
2012	287 372
Total 2008 – 2012 (tonnes of CO_2 equivalent)	**1 141 703**

Table E.5. Baseline Emissions during the first commitment period (2008 – 2012)

Year	Baseline emissions (t CO_2 equivalent)
2013	293 325
2014	299 218
2015	305 142
2016	311 063
2017	316 986
2018	322 907
2019	328 830
2020	334 781
Total 2013 – 2020 (tonnes of CO_2 equivalent)	**2 512 252**

Table E.6. Baseline Emissions during the second commitment period (2013 – 2020)

Year	Baseline emissions (t CO_2 equivalent)
2021	334 781
2022	334 781
2023	334 781
2024	334 781
2025	334 781
2026	334 781
2027	334 781
2028	334 781
2029	334 781
2030	334 781
2031	334 781
2032	334 781
2033	334 781
2034	334 781
2035	334 781
2036	334 781
2037	334 781
2038	334 781
2039	334 781
2040	334 781
Total 2021 – 2040 (tonnes of CO_2 equivalent)	**6 695 620**

Table E.7. Baseline Emissions during the period 01/01/2021 – 31/12/2040

Year	Baseline emissions (t CO_2 equivalent)
Total 2008 – 2012 (tonnes of CO_2 equivalent)	**10 349 575**

Table E.8. Total estimated Baseline Emissions during the crediting period 01/01/2008 – 31/12/2040

For detailed information see sections **D.1.1. - D.1.4** and **Appendixes 4 - 6**.

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

Project Emission Reduction = Baseline emission - (Project emission +Estimated leakage).

Project Emission Reductions are presented in Tables E.9 - E.12.

Year	Estimated Emission Reductions (t CO_2 equivalent)
2008	38 614
2009	44 670
2010	47 899
2011	52 653
2012	76 575
Total 2008 – 2012 (tonnes of CO_2 equivalent)	**260 411**
Annual average of estimated emission reductions over the first commitment period (tonnes CO_2 equivalent)	52 082

Table E.9. Estimated Emission Reductions during the first commitment period (2008 – 2012)

Year	Estimated Emission Reductions (t CO_2 equivalent)
2013	82 528
2014	88 675
2015	94 599
2016	100 520
2017	106 443
2018	112 364
2019	118 287
2020	124 238
Total 2013 – 2020 (tonnes of CO_2 equivalent)	**827 654**
Annual average of estimated emission reductions over the second commitment period (tonnes CO_2 equivalent)	103 457

Table E.10. Estimated Emission Reductions during the second commitment period (2013 – 2020)

Year	Estimated Emission Reductions (t CO_2 equivalent)
2021	124 238
2022	124 238
2023	124 238
2024	124 238
2025	124 238
2026	124 238
2027	124 238
2028	124 238
2029	124 238
2030	124 238
2031	124 238
2032	124 238
2033	124 238
2034	124 238
2035	124 238
2036	124 238
2037	124 238
2038	124 238
2039	124 238
2040	124 238
Total 2021 – 2040 (tonnes of CO_2 equivalent)	**2 484 760**
Annual average of estimated emission reductions over the post- second commitment period (tonnes CO_2 equivalent)	124 238

Table E.11. Estimated Emission Reductions during period 01/01/2021 – 31/12/2040

Year	Estimated Emission Reductions (t CO_2 equivalent)
Total 2008 – 2040 (tonnes of CO_2 equivalent)	**3 572 825**
Annual average of estimated emission reductions over the crediting period (tonnes CO_2 equivalent)	108 267

Table E.12. Total Estimated Emission Reductions during the crediting period 01/01/2008 – 31/12/2040

For detailed information see **Appendixes 4 – 6** (Microsoft Excel Tables).

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

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
2008	180 179	0	218 793	38 614
2009	162 543	0	207 213	44 670
2010	165 744	0	213 643	47 899
2011	162 029	0	214 682	52 653
2012	210 797	0	287 372	76 575
Total 2008 – 2012 (tonnes of CO_2 equivalent)	**881 292**	**0**	**1 141 703**	**260 411**
2013	210 797	0	293 325	82 528
2014	210 543	0	299 218	88 675
2015	210 543	0	305 142	94 599
2016	210 543	0	311 063	100 520
2017	210 543	0	316 986	106 443
2018	210 543	0	322 907	112 364
2019	210 543	0	328 830	118 287
2020	210 543	0	334 781	124 238
Total 2013 – 2020 (tonnes of CO_2 equivalent)	**1 684 598**	**0**	**2 512 252**	**827 654**
2021	210 543	0	334 781	124 238
2022	210 543	0	334 781	124 238
2023	210 543	0	334 781	124 238
2024	210 543	0	334 781	124 238
2025	210 543	0	334 781	124 238
2026	210 543	0	334 781	124 238
2027	210 543	0	334 781	124 238
2028	210 543	0	334 781	124 238
2029	210 543	0	334 781	124 238
2030	210 543	0	334 781	124 238
2031	210 543	0	334 781	124 238
2032	210 543	0	334 781	124 238
2033	210 543	0	334 781	124 238
2034	210 543	0	334 781	124 238
2035	210 543	0	334 781	124 238
2036	210 543	0	334 781	124 238
2037	210 543	0	334 781	124 238
2038	210 543	0	334 781	124 238
2039	210 543	0	334 781	124 238
2040	210 543	0	334 781	124 238
Total 2021 – 2040	**4 210 860**	**0**	**6 695 620**	**2 484 760**

(tonnes of CO_2 equivalent)				
Total 2008 - 2040 (tonnes of CO_2 equivalent)	**6 776 750**	**0**	**10 349 575**	**3 572 825**

Table E.13. Table providing values obtained when applying formulae above

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:

According to the Ukrainian regulations, the design documentation for the new building, reconstruction and major technical re-equipment of industrial and civil objects may include the environmental impact assessment.

Environmental Impact Assessment (EIA) is directed on determination of scales and levels of the project activity impact on an environment, on development of measures for prevention or reduction of this impact, on estimation of acceptability of project decisions from the ecological point of view.

The legislative requirements to EIA materials content are enshrined in the Article 36 of the Law of Ukraine «On ecological expertise»[45]. Requirements to the structure, composition and content of the EIA sections are enshrined in the State Building Norms of Ukraine DBN A.2.2-1-2003 "Composition and content of the Environmental Impact Assessment (EIA) materials at designing and construction of enterprises, buildings and premises"[46].

Annex E of DBN A.2.2-1-2003 contains a list of activities and objects that generate a risk of negative environmental impacts. For such projects the execution of complete EIA is necessary, and Ministry of Ecology and Natural Resources of Ukraine is responsible for control of these EIAs. This list does not contain such type of activity as energy saving measures for improving the efficiency of municipal enterprises, thus the EIAs for such activity are not obligatory.

Overall, this JI project will have a positive effect on environment. The following points will give detailed information on environmental benefits.

1. Project implementation will reduce GHG emissions due to increased efficiency of the water supply and heating systems. This will be achieved through modernization of existing and implementation of modern pump and boiler equipment, implementation of technologies of using the renewable energy sources, etc.

2. Due to electricity saving, project implementation will reduce also emissions of SO_2, NO_x, CO and particulate matter by power plants.

3. Due to fuel saving, project implementation will reduce also emissions of NO_x, SO_2, CO and particulate matter by fuel combusting equipment.

Transboundary impacts of the project activity, according to their definition in the text of "Convention on Transboundary Pollution at a great distance" ratified by Ukraine, will not take place, because the ordinary activity of the AR Crimea water complex and the North-Crimean canal does not cause transboundary transfers of pollutants, and the project activity, that reduces negative impact on the environment, does not cause transboundary transfers as well.

[45] http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=45%2F95-%E2%F0

[46] http://document.ua/proektuvannja.-sklad-i-zmist-materialiv-ocinki-vpliviv-na-na-nor3146.html

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 the ambient air

Implementation of the project will have positive impact on ambient air:

1) Reduction of electricity consumption by the objects of departments of water industry will result in reduction of emissions of the NO_x, SO_2, CO and particulate matter from grid power stations;

2) Reduction of NO_x, SO_2, CO and particulate matter due to fuel saving by the objects of departments of water industry.

Relevant regulation in the sphere of ambient air is represented by the Law of Ukraine "On Protection of Atmospheric Air"[47].

Impact on the water medium

Implementation of the project will have positive impact on the water medium. It will enable to reduce water losses while pumping.

Relevant regulation in the sphere of water medium is represented by Water Code of Ukraine[48].

Impact on the land use

Implementation of the project will have positive impact on the land / soil use in result of improving melioration activities.

Relevant regulation in the sphere of land use is presented by the Land Code of Ukraine[49].

Impact on the biodiversity

Impact on biodiversity is not present.

Waste generation, treatment and disposal

In the process of project implementation the generation of waste will occur after disassembling of physically and morally obsolete equipment.

Recycling of old equipment will have definitely positive impact on the environment.

Relevant regulation in the sphere of is represented by Law of Ukraine "On waste products"[50].

[47] *http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=2707-12*

[48] *http://zakon.nau.ua/doc/?uid=1011.17.21&nobreak=1*

[49] *http://zakon2.rada.gov.ua/laws/show/2768-14*

[50] *http://zakon2.rada.gov.ua/laws/show/187/98-%D0%B2%D1%80*

SECTION G. Stakeholders' comments

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

As project activity won't provide negative influence on environment and negative social effect, the special public discussion was not hold.

However, the Republic Committee on water industry construction and irrigated agriculture of the AR Crimea, in whose sphere of regulation the water complex departments that implement the JI project are included, constantly inform the public about planned measures for modernization as well as about stage of their implementation at its official website [51]. Stakeholders have opportunity to comment and participate in discussion of these issues. To date, no negative comments have been received.

This project was presented at the XXII International Conference "Problems of Ecology and Exploitation of Energy Objects" (Yalta, 2012), where it was comprehensively discussed with representatives of governmental, water industry and district heating organizations.

The issues of implementation of energy saving technologies were focused on specific thematic seminar "Implementation of energy saving technologies - a priority area of water industry of Crimea" held on November 8-9, 2012.

[51] http://www.vodhoz.crimea.ua/

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex 2

BASELINE INFORMATION

Main information on baseline setting is presented in section B.2. The key elements of the baseline (including variables, parameters and data sources) are presented in table below.

	Symbol	Data variable	Data unit	Measured (m), calculated (c), estimated (e)
1	$\mathbf{W}_i^b$	Volume of water pumped by objects of the department *i* in the base year	ths. m^3	m
2	$\mathbf{EC}_i^b$	Electricity consumption by objects of the department *i* in the base year	MWh	m
3	$\mathbf{SEC}_i^b$	Specific electricity consumption by objects of the department *i* in the base year	MWh/ ths.m^3	c
4	$\mathbf{SEC}_i^d$	Dynamic specific electricity consumption by objects of the department *i* in reported year *y* in terms of the baseline scenario	MWh/ ths.m^3	c
5	$\mathbf{B}_i^b$	Fuel consumption by the objects of department *i* in the base year	ths.m^3 (t)	m
6	$\mathbf{NCV}_i^b$	Averaged net calorific value of fuel consumed by the objects of department *i* in the base year	GJ/ths.m^3 (GJ/t)	c
7		Carbon emission factors in reported year *y* for:		Normative documents
7.1	$\mathbf{EF}_{CO2,F,y}$	Fuel		Calculated based on the data from the "National inventory of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine in 1990 – 2010"[52], Annex 2, section P2.5
	$\mathbf{EF}_{CO2,NG,y}$	- natural gas	t CO_2/GJ	,- Table P2.6.
	$\mathbf{EF}_{CO2,coal,y}$	- coal	t CO_2/GJ	- Table P2.8.
	$\mathbf{EF}_{CO2,fo,y}$	- fuel oil	t CO_2/GJ	- Table P2.5.

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

7.2	$\mathbf{EF}_{CO2,ELEC,cons,y}$	Electricity consumption	t CO_2e/ MWh	Normative documents: Orders of the National Environmental Investment Agency of Ukraine: # 62 dated 15/04/2011[53]; # 63 dated 15/04/2011[54]; # 43 dated 28/03/2011[55]; # 75 dated 12/05/2011[56].

Table An2-1. The key elements of the baseline

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

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

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

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

Annex 3

MONITORING PLAN

This monitoring plan describes the project specific approach that will be used to calculate the amount of greenhouse gas emission reductions resulting from implementation of the JI project "Greenhouse gas emission reduction due to modernization of objects of the AR Crimea water complex and the North-Crimean canal". Modernization of objects of water industry and heating is expected to result in improved performance of these systems. Each component of the JI project is expected to result in reduction of greenhouse gas emissions, that will be quantified using the project specific approach presented in **Section D** and this **Annex 3 "Monitoring Plan".**

Relevant monitoring approach:

In course of development of the monitoring plan for this JI project, the project specific approach, developed for this project, with using of the elements of methodology AM0020 for water pumping focused activity, generally similar to approaches that have been used in a number of JI projects previously, was used (see **Section B.1** and **Section D**).

Parameters to be monitored

Monitoring project specific approach identifies and takes into account the parameters that are need to be monitored at regular intervals. These parameters will then be input into a project Tracking Database, which will be an Excel based spreadsheets that will track GHG emission reductions for each monitoring period.

Parameters to be monitored are presented in tabular form below.

Parameter number and name	**1.** Volume of water pumped by objects of the department *i* in the reported year *y*
Description	Volume of water pumped by objects of the department *i* in the reported year *y*
Monitoring method	Measurements by meters (flowmeters) or determination based on the electricity consumption in accordance with the approved methodology (MVV 964.21-01 "Volume and volume flow of water pumped by the pump station")
Recording frequency	Measured continuously and calculated once per year (reported period)
Background data	Instrument readings are registered in the paper journals at every object.
Calculation method	Summation over all objects of a department

Parameter number and name	**2.** Electricity consumption by objects of the department *i* in the reported year *y*
Description	Electricity consumption by objects of the department *i* in the reported year *y*
Monitoring method	Electricity meters
Recording frequency	Measured continuously and calculated once per year (reported period)
Background data	Instrument readings are registered in the paper journals at every object.
Calculation method	Summation over all objects of a department

Parameter number and name	**3.** Fuel consumption by objects of the department *i* in the reported year *y*
Description	Fuel consumption by objects of the department *i* in the reported year *y*
Monitoring method	Measurements are taken: for natural gas by gas flow meters, for solid fuel (coal and wood) by the balance devices, for fuel oil by level in the storage tank, as well as is determined by the bills for the purchased fuel
Recording frequency	Registered every day and calculated once per year (reported period)
Background data	Instrument readings are registered in the paper journals at every object.
Calculation method	Summation over all objects of a department

Parameter number and name	**4.** Averaged net calorific value of fuel consumed by objects of the department *i* in the reported year *y*
Description	Averaged net calorific value of natural gas/ coal/ fuel oil for reported period calculated by net calorific value
Monitoring method	Accepted in accordance with information of fuel supplier
Recording frequency	Calculated once per year (reported period)
Background data	Registered in the paper journal
Calculation method	Weighted average value

Parameter number and name	**5.** Carbon emission factor in the reported year *y*
Description	Carbon emission factor for fuels and for electricity consumption in the reported year *y*
Monitoring method	Normative documents
Recording frequency	Once per year
Background data	For fuels the carbon emission factor are calculated based on the data from the "National inventory of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine in 1990 – 2010", Annex 2, section P2.5. The values of the carbon emission factors for electricity consumption were taken for relevant years according to Orders of the National Environmental Investment Agency of Ukraine # 62 dated 15/04/2011; # 63 dated 15/04/2011; # 43 dated 28/03/2011; # 75 dated 12/05/2011. In course of development of the Monitoring reports for this project, the valid at that time values of the Carbon emission factors for corresponding period will be used.
Calculation method	Carbon emission factors for fuels (t CO_2/GJ) are calculated by carbon content of a fuel (t C/TJ, according to the "National inventory…") multiplied by the ratio of molar mass of carbon dioxide (CO_2) to carbon (C).

Description of monitoring system

The control and monitoring system comes to measurement of water pumped by pump stations, fuel and electricity consumption by the objects of departments of water industry. Other parameters are defined by calculations or taken from statistic data.

Monitoring equipment

The equipment to be used by the project executors for monitoring of the relevant parameters are summarized in Table An3-1.

ID number and data variable	Equip-ment	Accuracy	Calibration authority	Calibration interval	Procedure in case of failure
1. Volume of pumped water by objects of the department *i*	Flow-meters	+/-1%	PJSC "Krym-energo"	According to the passports of the meters	Failure should be immediately reported to the Project manager or Chief Engineer. If failure is not removed within 48 hrs, the equipment supplier should be ordered for repair. If repair is not possible, equipment should be replaced by equivalent item. Failure events are to be recorded in the site events log book
2. Electricity consumption by objects of the department *i*	Electricity meters	+/- (0.2…1) % Usually 0.2%			
3. Fuel consumption by the objects of department *i*	Gas flow meters	+/- (0.5…2) % Usually 1%			

Table An3-1. Monitoring equipment

Monitoring of environmental impacts

As the project involves rehabilitation of existing water industry and heating systems leading to improvement of their energy efficiency and therefore to mitigation of environmental impacts, and is not a new building project, no negative environmental impacts are expected.

There is therefore no need to monitor special environmental impact indicators during implementation and operation of the project activities.

Project management

The overall responsibility for the project management and implementation is carried out by the Head of Krasnoperekopsk department of water industry, Mr. Vladyslav Maslianyk, and appointed responsible persons DWIs that implement the project.

Possible bottlenecks and mistakes in project implementation should be identified and solved by responsible stuff of DWIs that implement the project.

Responsibilities for data collection

Appointed responsible persons at DWIs that implement the project are presented in Table An3-2.

Dr. Dmytro Paderno, deputy director of the Institute of Engineering Ecology, is responsible for baseline and monitoring project specific approach development.

Dr. Nonna Pavliuk, Senior Researcher of the Institute of Engineering Ecology, is responsible for data processing.

Data collection is provided in the following way:

1. Collect data on the volume of pumped water is provided in two ways:

- the majority of facilities are equipped with instruments and devices for measuring the volume of pumped water. Machinists of pump stations daily record performance of water meters and report information to the dispatcher service of a department, where the data are entered into the logbook of water consumption accounting (accounting with water measuring instruments and devices, form #POD-11);

- in case of absence of metering equipment for volume of pumped water, machinists of PSs record daily in the pump station operating journal the average daily volume of water pumped by the indirect method - by electricity consumption in accordance with the approved methodology (MVV 964.21-01 “Capacity and volume consumption of water that transported by the pump station”) and report information to the dispatcher service of a department.

2. Data collection on electricity consumption is provided in the following order: operator of a pump station daily collects readings of electricity meters and report information to the dispatcher service of a department, where data are entered into the logbook of electricity consumption, electricity consumption is calculated for each facility and overall for a department.

3. Fuel consumption is measured: for natural gas by gas flow meters, for solid fuel (coal and wood) by the balance devices, for fuel oil by level in the storage tank, as well as is determined by the bills for the purchased fuel.

Data on fuel consumption are registered in a paper journal.

5. Every quarter Departments of water industry fill special reporting forms “11-CN” and “2TP-vodhosp”, and transfer them to the of statistics bodies.

Data monitored and required for emission reductions calculation and verification, according to paragraph 37 of the “JI guidelines”, are to be kept for two years after the last transfer of ERUs for the project.

Scheme of data collection for a Monitoring Report is shown at Fig. An3-2.

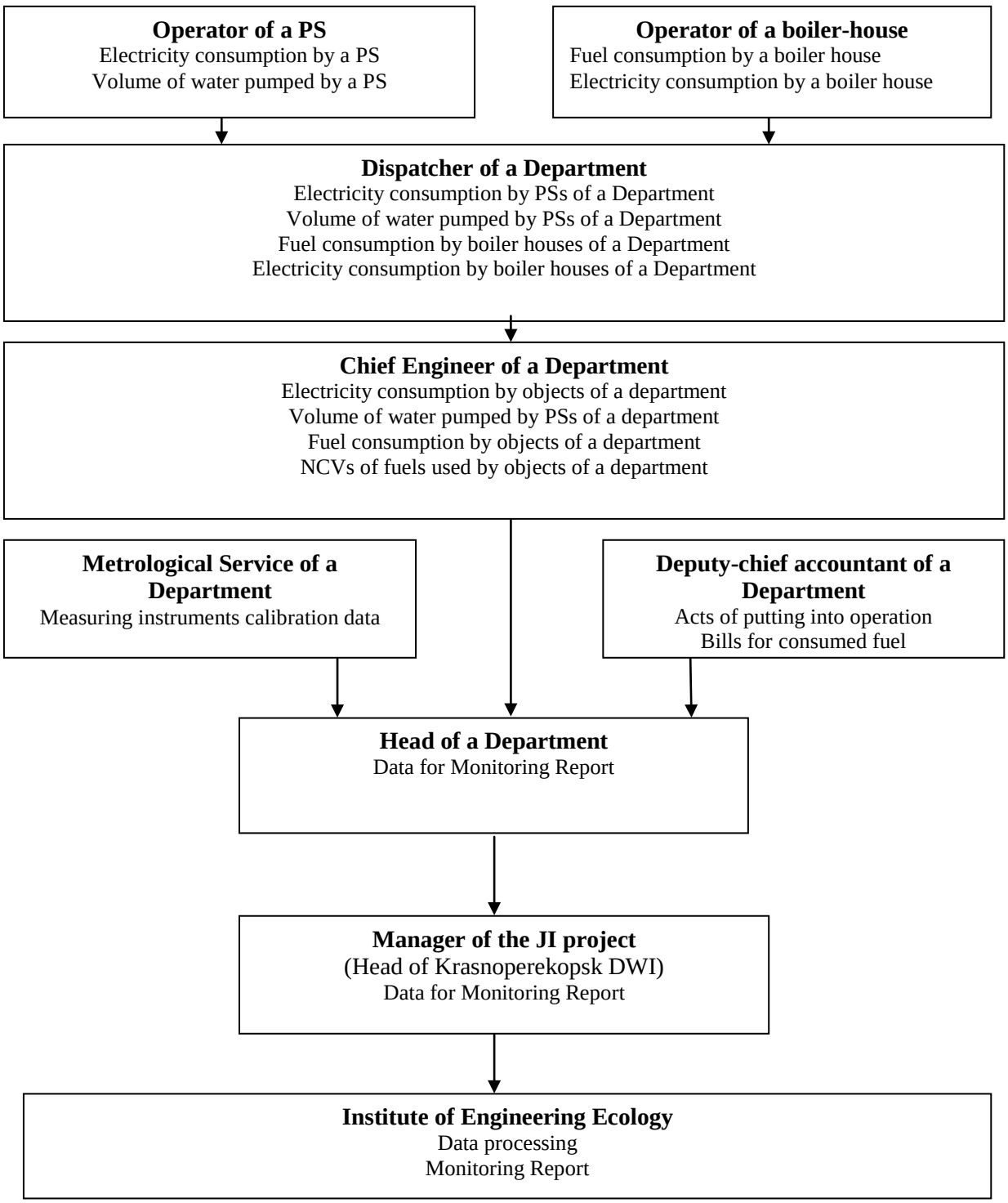

Fig.An3-1. Scheme of data collection for Monitoring Report

Trainings

As far as the main activity of the departments of the water complex that implement the JI project will not be changed in course of the project implementation, the special technical trainings for personnel are not necessary.

The technical personnel of the DWIs have sufficient knowledge and experience for implementation of the project activity and maintenance of the usual equipment.

In cases of the new (never used at this DWI before, for example foreign produced pumps and boilers, etc.) equipment installation, the company - producer of this equipment should provide trainings for personnel.

DWIs that implement the project provide personnel retraining according to protection of labour norms. The DWIs have the Labour protection departments, which are responsible for raising the level of personnel skills and trainings.

In course of the JI project development, specialists of Institute of Engineering Ecology carried out a comprehensive consultations and trainings for representatives of the involved departments of the water complex on the necessary data collection according to Monitoring plan for the project.

The special trainings were held in January, 2013.

The special group was organized consisted of representatives of DWIs that implement the project and Institute of Engineering Ecology, in particular:

Vladyslav Maslianyk - Krasnoperekopsk DWI, Head of Department
Roman Novachok – Krasnoperekopsk DWI, Chief Engineer;
Sergiy Petryk – Dzhankoy DWI, Head of Department;
Yuriy Savvateev – Krasnohvardiyske IDWI, Head of Department;
Sergiy Horodnichev – Pervomayske DWI, Head of Department;
Heorgiy Sunder– CCD, Head of Department;
Oleg Bryazkun – CCD, Chief Engineer;
Mykola Truhan –Rosdolne IDWI, Head of Department;
Yuriy Shcherbakov – Rosdolne IDWI, Chief Engineer;
Hrygoriy Yusko– Saky IDWI, Head of Department;
Valeriy Logvyn– Institute of Engineering Ecology, Engineer;
Dmytro Kirzhner– Institute of Engineering Ecology, Engineer.

Responsibilities for data management

All collected data will be transferred to Vladyslav Maslianyk - the Head of the Krasnoperekopsk DWI, who will be responsible for relevant data storage and archiving. Valeriy Logvyn, Nonna Pavliuk and Nataliya Bezushko, the specialists of the Institute of Engineering Ecology, will be responsible for entry of the data into the monitoring spreadsheets, data processing according to the JI project specific approach and development of the Monitoring Reports. Support and coordination of monitoring and verification processes will be undertaken by Dmytro Paderno, deputy director of the Institute of Engineering Ecology.

Responsibilities for data management are presented in Table An3-2.

Activity	Responsible person	
	Name	Position and department
Data storage and archiving	Roman Novachok	Chief engineer of Krasnoperekopsk department of water industry
Data storage and archiving	Sergiy Khrebtov	Chief engineer of Krasnohvardiyske inter-district department of water industry
Data storage and archiving	Volodymyr Andryukhin	Chief engineer of Dzhankoy department of water industry
Data storage and archiving	Volodymyr Lebedev	Deputy head of Connecting canal Department
Data storage and archiving	Sergiy Sinyuk	Deputy head of Nyzhnyohirskyy inter-district department of water industry
Data storage and archiving	Valentyn Kushnerenko Volodymyr Oberemok	The North-Crimean canal Department Main power engineering specialist Head of water service
Data storage and archiving	Volodymyr Tretyachenko	Lenine inter-district department of water industry
Data storage and archiving	Pavlo Ovsepyan	Tayganske inter-district department of water industry
Data storage and archiving	Mykola Kostyanov	Sovetskyy department of water industry
Data storage and archiving	Olexandr Bardin	Deputy head of Rosdolne inter-district department of water industry
Data storage and archiving	Mykola Chekmenev	Chief engineer of Salgirske inter-district department of water industry
Data storage and archiving	Sergiy Gaponov	Chief engineer of Bakhchysaray inter-district department of water industry
Data storage and archiving	Olexandr Ivankov	Chief engineer of Pobedne inter-district department of collector-drainage systems
Data storage and archiving	Konstantyn Golovko	Chief engineer of Kirovske inter-district department of water industry
Data storage and archiving	Olexandr Krupko	Chief engineer of Saky inter-district department of water industry
Data storage and archiving	Dmytro Zhurbin	Deputy head of Pervomayske department of water industry
Management of the JI project	Vladyslav Maslianyk	Head of the Krasnoperekopsk department of water industry
Data processing according to the JI project specific approach, development of Monitoring Reports	Nonna Pavliuk	Senior scientific researcher of Institute of Engineering Ecology
Data processing according to the JI project specific approach, development of Monitoring Reports	Nataliya Bezushko	Engineer of Institute of Engineering Ecology

Data processing according to the JI project specific approach, development of Monitoring Reports	Valeriy Logvyn	Engineer of Institute of Engineering Ecology
Support and coordination of monitoring and verification processes	Dmytro Paderno	Deputy director of the Institute of Engineering Ecology

Table An3-2. Responsibilities for data management