Project Design Document
PDD – Version 1

A General Project Description

A 1 PROJECT IDENTIFICATION

Title of the project activity:
"Rehabilitation of the district heating system of Crimea"

Applicant:
Leasing Enterprise "Krymteplocomunenergo"

Date of Submission: 12.07.2005

A 2 GENERAL INFORMATION

A 2.1 General information	
Project name	Rehabilitation of the district heating system of Crimea
Project type	☒ Avoidance ☒ Reduction
Description of the project activity and its purpose ***(EB PDD A.2.)***	The project activity refers to rehabilitation and replacement of the existing heat generating and heat distribution equipment in the Autonomous Republic of Crimea (excluding the city of Sevastopol), switching inefficient oil-fired boilers to gas, power production at 6 CHP units for own needs, and landfill gas recovery and utilization. The purposed project activities will obviously improve district heating system efficiency and will make it operating in a fuel-saving manner, producing the same heat energy per unit of fuel consumption. Chosen technologies include the following measures: - Replacement of low-efficient outmoded boilers by new ones with higher efficiency; - Upgrade of boilers' burners for the combustion improvement; - Installation of heat-utilizers (contact heat-recovery gas-cleaning apparatuses) that provide utilization and recovery of flue gas heat as well as additional heat from steam condensation when temperature of flue gas falls below dew point; - Minimization of the pipeline length by moving heat generating source closer to consumer; - Improvement of network organization and replacement of heat exchangers at Central Heating Points (CHPs); - Replacement of the main network pipelines with diameter range 108 mm to 720 mm by the pre-insulated pipelines; - Installation of 6 CHP units (gas engines) operated on natural gas with total capacity 3 MWe for heat and power production; - Landfill gas extraction at Simferopol city landfill and its further utilization at closest to the landfill boiler house – at 66th Glinki Street in Simferopol. Project activities without a doubt will contribute to sustainable development of Crimea peninsula. First of all, saving natural gas is a sustainable practice by the definition. Secondly, lower losses during heat generation and its distribution will allow district heating system producing more heat for consumers and less for environment. Thirdly, the quality of heat supply and hot-water supply services for all types of consumers will be improved, which have a positive social effect. Use of electric heaters in the heating period will cease substantially as well as boiling water for bathing at some places. Sustainable fuel consumption by the LE "Krymteplocomunenergo" will ensure tangible economic effect to the enterprise.
Description of the background to the project	Communal sector of Ukraine is not attractive for investors. However the sector is socially important despite of its financial unattractiveness. The idea of employing JI mechanism for this project based on continuous degradation of heat-generating and distribution equipment, followed by the efficiency droop up to 1% annually simultaneously with increase of losses, fuel consumption and GHG emissions. Even though the DH sector receives budget money as a compensation for non-payments, it is only enough to cover the costs of primary tasks to sustain heat-generating system and services in the existing condition. LE Krymteplocomunenergo is a natural monopolist in heat production on all territories where it operates. It sells heat energy in form of heat and hot water services. Generated heat is totally delivered to local consumers, namely households, municipal consumers and state-owned organizations. The market for this service is stable during years. The project is already endorsed by local authorities, namely the Supreme Council of

	the Autonomous Republic of Crimea, and Ukrainian governmental representatives, namely Ministry of Environmental Protection of Ukraine and State Committee of Ukraine for Housing and Municipal Economy. Since Expression of Interest submission in September 2004, the project was revised. A few activities were excluded from the project. Only activities implemented after October 2004 considered as a part of a JI project activities.

A 2.2 Category(ies) of project activity	
Project category ***(EB PDD A.4.2.)***	☐ Construction (retrofitting) of combined heat and power coupling plants ☐ Energy sources transfer in energy conversion installations and production plants to renewable energy sources or from energy sources with high carbon content to energy sources with lower carbon content, especially in existing district heating systems ☐ Construction (or retrofitting) of generating plants operated with renewable energy sources (especially wind power stations, biogas or biomass combined heat and power coupling as well as hydroelectric power plants) ☐ Projects whose purpose is the avoidance or (energy) recovery of landfill gas ☐ Waste management measures which contribute to avoidance of greenhouse gas emissions especially through energy recovery of waste, if possible under consideration of waste heat utilisation ☒ Projects serving the reduction of end-user energy consumption in residential accommodation, public and private service office buildings as well as in industrial applications and processes (including waste heat potentials) (energy efficiency projects) ☐ Other: _____

A 2.3 Greenhouse gases	
Greenhouse gases reduced through the project	☒ CO_2 ☒ CH_4 ☐ N_2O ☐ HFCs ☐ PFCs ☐ SF_6

For small-scale projects simplifications in certain areas are possible (baseline, monitoring plan etc.). Information is available at http://cdm.unfccc.int/.

A 2.4 CDM project category	

CDM project category	☐ Normal project ☐ Small-scale project o Renewable energy project activity with a maximum output capacity equivalent of up to 15 megawatts (or an appropriate equivalent) o Energy efficiency improvement project activity which reduces energy consumption, on the supply and/or demand side, by up to the equivalent of 15 gigawatthours per year o Other project activity that both reduces anthropogenic emissions by sources and directly emits less than 15 kilotonnes of carbon dioxide equivalent annually

A 3 PROJECT PARTICIPANTS *(EB PDD A.3.)*

A 3.1 Applicant	
Name	Leasing Enterprise "Krymteplocomunenergo"
Type of organization	☐ Authorities: _____ ☐ Private enterprise ☐ NGO ☒ Other: Leasing Enterprise
Other functions of applicant within the project	☐ Sponsor ☐ Intermediary ☐ Technical consultant ☒ Other: Implementation entity
Main activities, knowledge and experience	Heat and hot water supply services, maintenance of boilers, networks and other energy equipment of the Autonomous Republic of Crimea excluding the city of Sevastopol
Address	3-A Gajdara Str., Simferopol, Autonomous Republic of Crimea, Ukraine 95000
URL	
Phone/fax	Phone: + 38 0652 22 03 01, Fax + 38 0652 22 12 13
E-mail	tce@tce.crimea.com
Contact person *Name, department, phone, fax, e-mail*	Director, Vail' Igor Valentynovych Phone: + 38 0652 22 03 01, Fax + 38 0652 22 12 13 E-mail: tce@tce.crimea.com

A 3.2 Project developer	
Name	Institute of Engineering Ecology Ltd.
Type of organization	☐ Authorities: _____

	☒ Private enterprise ☐ NGO ☐ Other: _____
Other functions of project developer within the project	☐ Sponsor ☐ Intermediary ☒ Technical consultant ☐ Other: _____
Main activities, knowledge and experience	Development, production and application of both: new environmentally friendly technologies and energy saving equipment; carrying out various environmental investigations and examinations as well as environmental and energy audit of industrial enterprises.
Address	2-a Zheliabova Str., 4-th Floor, Kyiv, Ukraine, 03057
URL	www.engecology.com
Phone/fax	Phone/Fax: +38 044 456 92 62
E-mail	engeco@kiev-page.com.ua
Contact person *Name, department, phone, fax, e-mail*	Dr. Eng. Alexander Sigal, Director Phone/Fax: +38 044 456 92 62 E-mail: engeco@kiev-page.com.ua

A 3.3 Other project participants	
Name	Scientific Engineering Centre “Biomass”
Type of organization	☐ Authorities: _____ ☒ Private enterprise ☐ NGO ☐ Other: _____
Other functions of project participant within the project	☐ Sponsor ☐ Intermediary ☒ Technical consultant ☐ Other: _____
Main activities, knowledge and experience	Research and development company rendering high-quality consulting in the field of energy production (mainly from biomass). Provides following services: preparation of feasibility studies, selection of commercial equipment for energy generation, design and engineering services, translation of technical documentation, preparation of tender documentation for JI projects.

	Participated in preparation of: 6 Expression of Interest documents for the First Call of Austrian JI/CDM Programme, 1 project proposal 3 Expression of Interest for ERUPT-5 Dutch tender, and 1 project proposal for ERUPT-4 tender.
Address	2-a Zheliabova Str., 2 Floor, Kiev, Ukraine 03057
URL	www.biomass.kiev.ua
Phone/fax	Phone/Fax: +38 044 456 94 62
E-mail	filonenko@biomass.kiev.ua
Contact person *Name, department, phone, fax, e-mail*	Consultant, Mr. Filonenko Oleksandr Phone/Fax: +38 044 456 94 62 E-mail: filonenko@biomass.kiev.ua

A 3.4 Other project participants	
Name	European Institute for safety and environmental security (Europaeisches Institut fuer Sanierung, Sicherheit, Versicherung und Umwelttechnik) **SVT e.V.**
Type of organization	☐ Authorities: _____ ☒ Private enterprise ☐ NGO ☐ Other: _____
Other functions of project participant within the project	☐ Sponsor ☐ Intermediary ☒ Technical consultant ☐ Other: _____
Main activities, knowledge and experience	Research, development and consulting organization. The main activities: a) neutral-expert, technical and nature-scientific activities, b) preliminary measure, c) risk management, c) consulting d) solving of problems in the field of environmental protection Participated in preparation of the JI project proposal 'District Heating System Rehabilitation' in Chernigiv region for ERUPT-4 tender.
Address	Oelwerkstrasse 25, 66359 Bous, Deutschland
URL	www.svt-umwelt.com
Phone/fax	Phone/Fax: + 49 683 4 92 07 50

E-mail	SVT-Bous@t-online.de
Contact person *Name, department, phone, fax, e-mail*	Dr. Vladimir Gomon Manager Phone/Fax: + 49 683 477 0771 E-mail: Gomon-Vladimir@t-online.de

A 4 LOCATION OF THE PROJECT ACTIVITY

A 4.1 Host country	
Host Country Party(ies) ***(EB PDD A.4.1.1.)***	Ukraine
Region/State/Province etc. ***(EB PDD A.4.1.2.)***	Autonomous Republic of Crimea
City/Town/Community etc. ***(EB PDD A.4.1.3.)***	Boiler houses and heat distribution networks of major cities and towns (Simferopol' city, Alushta district, Dzhankoj district, Evpatoria district, Kerch district, Rozdolne district, Feodosia district, Yalta district)

A 4.2 Location of the project activity	
Detail on physical location, including information allowing the unique identification of this project activity ***(EB PDD A.4.1.4.)*** *Please enclose a map of the project location.*	The project boundaries include boiler houses and heat distribution networks that supply heat and hot water to the locations mentioned in the previous paragraph. The project will provide complex modernization of heat-generating equipment at 188 boiler houses subjected to LE "Krymteplocomunenergo", where total number of boilers – 720, from which 646 are operational. Number of boilers under replacement 416, number of boilers under rehabilitation 48. 
Is the location in a nature reserve?	☐ Yes ☒ No
Will the project have effects on residents? *(e.g. noise, smell, other emissions, additional infrastructure, ...)*	No negative effect on residents of Crimea Peninsula is expected.

A 5 SCHEDULE

A 5.1 Schedule		
Starting date of the project activity *(e.g. start of construction)* ***(EB PDD C.1.1.)***	October 2004	
Construction period	October 2004 – December 2007	
Construction phases	Measures	Duration
	Implementation of boilers replacement and rehabilitation	October 2004 – August 2007
	Implementation of networks replacement and rehabilitation	April 2006 – December 2007
Date of commissioning	December 31, 2007	
Expected operational lifetime of the project activity *(in years and months, e.g. two years and four months would be shown as: 2y-4m)* ***(EB PDD C.1.2.)***	25y-0m	

A detailed project schedule is to be enclosed.

#	Project stages	Period
1	**Boilers rehabilitation according to Appendix 1**	**10/2004 – 08/2007**
1.1	Designing boilers replacement and rehabilitation	10/2004 – 02/2007
1.2	Implementing boilers replacement and rehabilitation	10/2004 – 08/2007
2	**Rehabilitation of heat distribution networks according to Appendix 2**	**01/2006 – 12/2007**
2.1	Designing networks replacement and rehabilitation	01/2006 – 08/2006
2.2	Implementing networks replacement and rehabilitation	04/2006 – 12/2007

The crediting period corresponds to the period during which 'creditable' emission reduction certificates can be generated.

JI Projects

The Marrakesh Accords do not specify for how long emission reduction certificates can be generated by a JI project. It can however be assumed that the crediting period will correspond to the first commitment period (2008 - 2012).

CDM Projects

The crediting period of CDM projects is stipulated in the Marrakesh Accords as follows:

- 7 years with two extension options (each with renewed baseline determination), i.e. a maximum total of 21 years,
- once 10 years with no renewal option.

Crediting of the Certified Emission Reductions, CERs, can be performed retroactively from the year 2000. Contractual parties having carried out CDM projects since 2000 must be able to prove the fulfilment of the CDM criteria to be retrospectively credited CERs.

A 5.2 Choice of the crediting period	
JI projects	Starting date of the crediting period (01/10/2005): October 1, 2005
	Duration of the crediting period: 7y-7m
CDM projects ***(EB PDD C.2.1., EB PDD C.2.2.)***	□ Renewable crediting period *(at most seven years per period)* □ Fixed crediting period *(at most ten years)*
	Starting date of the (first) crediting period (DD/MM/YYYY): _____
	Length of the (first) crediting period: _____ *(in years and months, e.g. two years and four months would be shown as: 2y-4m)*

A 6 TECHNICAL DESCRIPTION OF THE PROJECT

A 6.1 Technology to be employed by the project activity	
Project technology used and listing of all measures *Please refer to Appendix 2.* ***(EB PDD A.4.3.)***	Technology and measures for efficiency improvement of the district heating system operated by LE "Krymteplocomunenergo": • Replacement of obsolete boilers by more efficient gas-fired boilers to increase boiler efficiency from 62-72% to 90-93%. • Rehabilitation of obsolete boilers through replacement of existing burners by upgraded ones with better intensity of furnace heat exchange and heat transfer due to increased radiant component, according to technologies, developed and patented by Institute of Engineering Ecology (project partner). Application of these technologies will add 8-10% to the efficiency (with total 90%) and enable reducing CO and NO_x emissions. • Installation of contact heat-recovery gas-cleaning apparatuses, developed and patented by Institute of Engineering Ecology, will allow utilizing and recovering the flue gas heat as well as additional heat of steam condensation, occurring when the flue gas temperature falls below dew point. Application of this technology will result in fuel consumption efficiency increase by 7-8%. The efficiency of boiler units with condensation heat-recovery systems reaches 100% and even more. • Rehabilitation of distribution network system will enable reducing heat energy losses from existing 10-16% to 6-13% for a pipeline: - Replacement of the major heat-network pipes with diameter 108 mm and larger by the pre-insulated pipes. - improvement of network organization and replacement of obsolete heat-exchangers at the Central Heating Points. These technologies have been already approved but not widely applied due to financial limitations. Therefore, some bottlenecks may occur, which is typical during implementation of new technologies and installation of new equipment. Installation of cogeneration units (6 gas engines, 0.5 MWe each) with total installed capacity 3 MWe will be incorporated into the project. German Deutz engine TBG 616 V12 K is a considered candidate for the installation. American landfill gas extraction technology will be applied at Simferopol MSW landfill. All captured landfill gas will be utilized at the closest boiler house on 66 Glinky Street in Simferopol. Evidence for the technical figures is given at **Annex 5**.

A 7 PROJECT ORGANISATION

A 7.1 Economic aspects	
Public funding of the project activity *Level and source of public*	Public funding is not expected.

funding for the project activity, including an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of the funding Parties ***(EB PDD A.4.5.)***	
Economic viability *A detailed financing plan and an economic viability calculation (for at least 15 years) has to be enclosed. Please refer to Appendix 1.*	
Indicative offer price for ERUs/CERs *Please include an illustration of the price calculation and of the underlying assumptions.*	6 EUR Assuming that at present time this price reflects average price for ERUs on JI market.

A 7.2 Legal aspects	
Status of the official approval process in the host country	Letter of Approval is under consideration at the Ministry of Environmental Protection of Ukraine

B Ecological, Socio-Economic and Development Aspects

According to article ***EB PDD F.1.*** documentation on the analysis of the environmental impacts, including transboundary impacts, shall be provided. This documentation has to be attached to the CDM EB PDD. If the impacts are considered significant by the project participants or the host Party, according to ***EB PDD F.2.***, conclusions and all references to support documentation of an environmental impact assessment that has been undertaken in accordance with the procedures as required by the host Party shall be provided.

The Austrian PDD asks for the following specifications.

B 1 Ecological Effects of the Project during Construction

The following section deals with the environmental effects of the project activity during the construction phase. Significant effects on the media ***water*** and ***air*** and with regard to ***waste*** and ***noise*** shall be described in detail as well as mitigation measures undertaken. Relevant regulation (national laws, directives etc.) has to be complied with. If nonexistent or not applicable the current national technological practice/standards are to be observed. Please also describe in detail if your project activity goes beyond these minimum requirements.

B 1.1 Environmental effects during construction	
Environmental effects during construction	Environmental effect: Positive effects. Old equipment to be removed will be recycled Mitigation measures: _____ o Compliance with relevant regulations/national technological standards o Relevant regulation: Law of Ukraine on Environmental Protection of Ukraine from 26.06.91 N 1268-12 with amendments from 21.06.01 N 2556-3. _____ *(Please indicate where and how it is available.)* o National technological practice/standard: Instructions on content and order of reporting on inventorization of pollutants from enterprises, KND 211.2.3.014-95 N 7 from 10.02.95 Kyiv. _____ *(Please state references.)* Does the project go beyond these minimum requirements? ☒ No o Yes: _____

Please extend the table if necessary.

B 2 ECOLOGICAL EFFECTS DURING THE PROJECT LIFETIME

The following section deals with the environmental effects of the project activity during the project lifetime. Significant effects on the media ***water*** and ***air*** and with regard to ***land use***, ***biodiversity*** and ***waste*** shall be described in detail as well as mitigation measures undertaken. Relevant regulation (national laws, directives etc.) has to be complied with. If nonexistent or not applicable the current national technological practice/standards are to be observed. Please also describe in detail if your project activity goes beyond these minimum requirements or displays other positive effects.

Water

B 2.1 Effects on the medium water	
Effects on the medium water *(e.g. abstraction of ground or surface water, pollution of surface water, composition of effluents etc.)*	☐ Not present ☒ Present Environmental effect: impact on water resources is will be the same as in baseline scenario. The existing technology of heat energy production exploited at the objects of LE "Krymteplocomunenergo" foresees discharging of waste water to the sewage network with obligatory chemical control in accordance to Water Code of Ukraine, GOST 28.74-82 "hygienic regulations and quality control", SNiP 4630-92 on determining maximum concentration limits for internal water bodies. Discharge of wastewater to the open water bodies will not take place. Mitigation measures: Project implementation will allow ceasing water consumption and as a result – amount of waste water. ○ Compliance with relevant regulations/national technological standards ○ Relevant regulation: _____ *(Please indicate where and how it is available.)* ○ National technological practice/standard: _____ *(Please state references.)* Does the project go beyond these minimum requirements? ○ No ○ Yes: _____
	☒ Positive effects: Project implementation will allow ceasing water consumption and as a result – amount of waste water

Air

B 2.2 Effects on the medium air	

Effects on the medium air *(e.g. quantity of emissions rejected, composition of emissions, etc.)*	☐ Not present ☐ Present Environmental effect: _____ Mitigation measures: _____ ○ Compliance with relevant regulations/national technological standards ○ Relevant regulation: _____ *(Please indicate where and how it is available.)* ○ National technological practice/standard: _____ *(Please state references.)* Does the project go beyond these minimum requirements? ○ No ○ Yes: _____
	☒ Positive effects: 1) Reduction of NOx, SOx, CO and PM due to application of cleaner technologies at boiler houses; 2) Reduction of electricity consumption results in lower emissions of the same air pollutants; 3) Heat stress on the atmosphere (due to lower temperatures of flue gases); 4) Lower emissions per unit of fuel at the same load on boiler house.

Land

Details on land use are normally only to be stated for Avoidance projects.

B 2.3 Land use	
Land use	-

Effects on land use *(e.g. erosion, landslip etc.)* *Please provide at least 2-3 different pictures of the planned location of the project under different view angles and show the dimension of the buildings of the project on these pictures.*	☒ Not present ☐ Present Environmental effect: _____ Mitigation measures: Recycling of old equipment. ○ Compliance with relevant regulations/national technological standards ○ Relevant regulation: Land Code of Ukraine (Please indicate where and how it is available.) ○ National technological practice/standard: GOST 17.4.1.02.-83 "Protection of Nature, Soils. Classification of chemical substances for pollution control." (Please state references.) Does the project go beyond these minimum requirements? ○ No ○ Yes: _____
	☐ Positive effects:

Biodiversity

Details on biodiversity are normally only to be stated for Avoidance projects.

B 2.4 Effects on biodiversity	

Effects on biodiversity *(Is the project situated in a protected zone, e.g. listed in a fauna or flora inventory?; Are there any fauna/flora species mentioned on Red Lists present on the area of the project location?[1]; Are there any endangered or indigenous plants or animals present on the area of the project location?; etc.)*	☒ Not present ☐ Present Environmental effect: _____ Mitigation measures: _____ ○ Compliance with relevant regulations/national technological standards ○ Relevant regulation: _____ *(Please indicate where and how it is available.)* ○ National technological practice/standard: _____ *(Please state references.)* Does the project go beyond these minimum requirements? ○ No ○ Yes: _____
	☐ Positive effects: _____

Waste

B 2.5 Waste	

[1] For information on such species see e.g. IUCN: International Union for the Conservation of Nature (www.iucn.org/themes/ssc/).

Waste generation, treatment and disposal *(e.g. total amount of waste generated, total amount of hazardous waste generated, composition of waste, treatment of hazardous/non-hazardous waste etc.)*	☐ Not present ☒ Present Environmental effect: In the process of project implementation the generation of waste will occur after disassembling of physically and morally obsolete equipment, burners, pipes, etc. Also there will occur some construction waste due to destruction of boiler settling, boiler house foundations etc. Mitigation measures: Metal wastes will be recycled, while construction waste will be partially recycled and partially brought to the landfills. ○ Compliance with relevant regulations/national technological standards ○ Relevant regulation: _____ *(Please indicate where and how it is available.)* ○ National technological practice/standard: _____ *(Please state references.)* Does the project go beyond these minimum requirements? ○ No ○ Yes: _____
	☒ Positive effects*:* Recycling of an old equipment is a positive effect by the definition.

B 3 SOCIO-ECONOMIC AND DEVELOPMENT ASPECTS

The Austrian JI/CDM Programme touches on developing country interests, therefore the Austrian Development Cooperation Act, BGBl. 2002/49 idgF is also applicable to this Programme. The goals of the Austrian development cooperation policy are: poverty eradication, peace and human security, as well as environmental protection and sustainable use of natural resources. These goals lead to the following questions within the Austrian JI/CDM Programme.

The sections which apply to CDM projects only resp. to JI and CDM projects are marked accordingly.

B 3.1 Poverty eradication	
CDM project How and how much does the project contribute to economic growth in the host country? *Please provide estimated figures of the added value of the project and the current GDP of the host country.*	
CDM project Does any possible competition between the project and the productive sector in the host country exist? Do subsidies for the project hamper the competitiveness of the host country?	
JI and CDM project Creation of new jobs by the project	☐ Number of highly qualified jobs: same ☐ Number of low qualified jobs: same
CDM project Is the host country an Austrian targeted country resp. an Austrian cooperation country?[2] Does the host country belong to the LDCs?	
B 3.2 Peace, security, democracy	
CDM project What is the ranking of the host country in the human rights reports and in international corruption rankings? *Please refer to www.amnesty.org*	

[2] Cp. e.g. http://www.bmaa.gv.at/view.php3?f_id=1463&LNG=en&version.

and www.transparency.org.	
CDM project Is the host country involved in an internal or cross-border armed conflict?	

B 3.3 Social Situation, Cultural Awareness	
CDM project Does the project limit physical or de facto access by indigenous or local users to natural resources (e.g. water)?	
CDM project How will possible negative socio-economic or cultural effects (resettlement, access to resources, conflict user-groups etc.) be healed?	
JI and CDM project Social security of workforce *Description of services in comparison to local standards (health insurance, accident insurance, other social services)*	The social package for all employees of LE "Krymteplocomunenergo" is standard and equal to social package for governmental enterprises in Ukraine.

B 3.4 Gender Equality	
JI and CDM project Equal Opportunities *Are the principles of equal opportunities reflected in the employment structure of middle and upper management?*	*Middle Management* Number of women: _____ Number of men: _____ *Upper Management* Number of women: _____ Number of men: _____

B 4 ADDITIONALITY AND SUSTAINABILITY

B 4.1 Additionality	
Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances *In addition please provide the total estimate of anticipated reductions in tonnes of CO_2 equivalent.* ***(EB PDD A.4.4.)***	The project activities including rehabilitation of boilers and heat distribution networks will increase energy efficiency of Crimean DH system thus allowing it producing the same amount of energy with less fuel consumed. Reduced fuel consumption will reduce CO_2 emissions. Installation of CHP units (Deutz gas engines) will generate new electricity for own needs of the LE "Krymteplocommunenergo". Produced electricity will replace electricity that earlier was consumed from the grid. Additionally, capture of landfill gas will eliminate a half of landfill methane emissions to the atmosphere according to the LFG extraction technology. Avoidance of methane emissions to the atmosphere will be turned into emission reduction units. Landfill gas (with considered methane content 50%) will be utilized at the nearest boiler house turning into CO_2 after its combustion instead of natural gas. Replacement of natural gas by landfill gas will also turn saved natural gas into emission reduction units. All project activities require substantial investment. Without carbon credits sales the project is not economically favorable for an Applicant, which makes implementation of most activities impossible. More economically feasible and realistic scenario without carbon credits sales is a baseline scenario with very slow reconstruction activities (maybe 1-2 boiler houses per year at each district). However, considering degradation of the whole system with efficiency droop at other objects, overall actual emissions of an Applicant would stay on the same level. This scenario is less environmentally favorable for the near future (including first commitment period 2008-2012), since GHGs emissions of an Applicant will continue to be kept at the same level or even higher, but economically such scenario is more attractive. Sooner implementation of project activities (until 2008) requires substantial expenditures, but also provides substantial GHG emission reductions, and makes project additional.

B 4.2 Sustainability	
Description of the project's contribution to the sustainable development of the host country *Please describe the view of the project participants of the contribution of the project activity to sustainable development.* ***(EB PDD A.2.)*** *This section should also include a description on how environmentally safe and sound technology and know-how to be used is transferred to the host Party, if any. What kind of project*	Project activities without a doubt will contribute to sustainable development of Crimea peninsula. First of all, saving natural gas is a sustainable practice by the definition. Secondly, lower losses in heat distribution networks will allow district heating system reducing energy wasting. Thirdly, the quality of heat supply and hot-water supply services for all types of consumers will be improved, which gives a positive social effect. Consumers will enjoy a better service. Use of electric heaters in the heating period will cease substantially as well as boiling water for bathing. Sustainable fuel consumption by the LE "Krymteplocomunenergo" will give tangible economic effect to the enterprise as will be shown in Business Plan. Most technological decisions were proposed by Institute of Engineering Ecology, German consultant SVT, and SEC "Biomass". The proposed technologies for complex modernization of heat generating equipment proved to be successful, though not widely used because they are relatively new and because investments to communal sector of Ukraine are very limited. Training courses for employees of LE "Krymteplocomunenergo" will be conducted several times per year in "Yalta Training

specific training is planned? Which maintenance measures are planned? ***(EB PDD A.4.3.)***	and Methodological Center 'Ecology'". Training courses will be initiated by the Applicant and will include lectures from producers of new equipment and practical training on operation of that equipment. Planned maintenance measures remain the same as in the business-as-usual scenario. Usually the equipment is repaired between heating seasons. No specific measures related to the project activities are needed.

C Stakeholder Comments

Stakeholders include all Parties or persons affected by the project. If several stakeholder comments are made, the table is to be copied and filled in separately for each stakeholder.

In the case of CDM projects stakeholder involvement is mandatory (also on an international level).

C 1 Identity of stakeholders	
Name	Supreme Council of Autonomous Republic of Crimea Standing Committee on industries, construction, transport, communications and fuel and energy complex
Type of organization	☒ Authorities: High level authority ☐ Private Enterprise ☐ NGO ☐ Individual Person ☐ Other: _____
Description of the effects of the project on the stakeholder	The Supreme Council of Autonomous Republic of Crimea by making positive decision on the JI project, which in the future promises fuel saving and reduction of GHG gases, promotes sustainable development practice in the region, and forms positive image of the new political authority in Crimea.
Address	18 Karl Marx Str., Simferopol, Autonomous Republic of Crimea, Ukraine 95000
Phone/fax	+38 0652 27 5311/ +38 0652 27 44 75
E-mail	
Contact person	Mr. Kotseruba, Head of the Committee

C 2 Stakeholder comments	
Brief description of the process on how comments by (local)	General Director of LE „Krymteplocomunenergo" submitted a petition on conformation of improvement of rented equipment (which belongs to Property Fund

stakeholders have been invited and compiled ***(EB PDD G.1.)***	of Autonomous Republic of Crimea) with the purpose of reduction of heat losses and GHG emissions into atmosphere in the framework of JI mechanism of Kyoto Protocol.
Summary of the stakeholder comments received ***(EB PDD G.2.)***	Stakeholder recommends Property Fund of the Autonomous Republic of Crimea and LE "Krymteplocomunenergo" in accordance with current legislation to prepare draft Decree by the Supreme Council of Autonomous Republic of Crimea on this issue and clarification note to it.
Report on how due account was taken of any comments received ***(EB PDD G.3.)***	The account is available as an excerpt of the Protocol of Committee meeting on 22.12.2004.

D Baseline

A JI or CDM project should result in additional emission reductions, this means such emission reductions which would have not taken place without these projects. To be able to prove such emission reductions it is essential to calculate the emissions

- in the project scenario and
- in the baseline scenario.

The actually achieved emission reductions result from the difference between the two scenarios.

Emission Reductions = (Baseline Emissions) — (Project Emissions)

D 1 BASELINE DEVELOPMENT

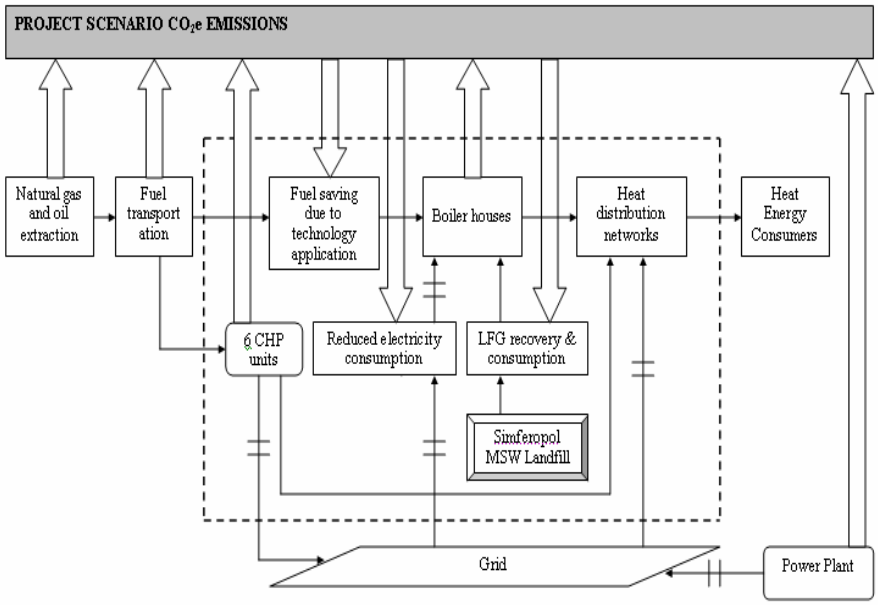
D 1.1 Details of baseline development	
Name and address of person/entity determining the baseline *Please provide contact information and indicate if the person/entity is also a project participant.* ***(EB PDD B.6.2.)***	Oleksandr Filonenko, Consultant SEC „Biomass“Consultant Scientific Engineering Centre "Biomass" P.O. Box 66, Kyiv-67, Ukraine, 03067 Tel. +38 (044) 456 94 62 Fax +38 (044) 456 94 62 E-mail: filonenko@biomass.kiev.ua Web: www.biomass.kiev.ua SEC “Biomass” develops parts of PDD as a subcontractor of the Institute of Engineering Ecology.
Date of completing the final draft of this baseline section (DD/MM/YYYY) ***(EB PDD B.6.1.)***	08/07/ 2005

The project can be split into various project components. This serves the definition of the project boundary and the choice of the baseline methodology. For details see e.g. the baseline study available at http://www.ji-cdm-austria.at or http://www.klimaschutzprojekte.at.

D 1.2 Project components	
Project components	☐ E (0) ☐ E (+ -) ☐ H (0)

	☐ H (+ -) ☐ M (-)

The project boundary defines which emissions in which framework must be considered in the emission calculation. The project boundary must include all significant emissions which are subject to the project operator's direct control and can be allocated to the project. For details see e.g. the baseline study available at http://www.ji-cdm-austria.at or http://www.klimaschutzprojekte.at.

D 1.3 Project boundary	
Description of how the definition of the project boundary related to the baseline methodology is applied to the project activity ***(EB PDD B.5.)*** *Please enclose a graphical representation of the project boundary.*	 Project boundary is represented by pointed rectangle on the graphical representation above. Project boundary represents changes that will differentiate baseline scenario from project scenario. 1) Fuel consumption will be reduced due to the technology to be applied, which includes boilers and networks rehabilitation. The technology provides producing the same amount of heat from less fuel. Thus project fuel consumption by boilers will be lower than baseline fuel consumption by the amount of saved fuel due to the project technology application. Correspondingly, the project emissions will be lower than baseline emissions due to higher efficacy of heat production. 2) Another technology to be applied within the project boundary allowing to save fuel and curb GHG emissions is a well known cogeneration technology. 6 CHP units (Deutz engine TBG 616 V12 K) with total installed capacity 3 MWe will be installed for electricity and heat production. Electricity shall be used for own needs reducing electricity consumption from the grid, while heat will be used for hot-water supply. 3) And the last technology to be applied within the project boundary is a fuel switch form natural gas to an alternative energy source – landfill gas for the purpose of hot-water supply. Landfill gas extraction and its utilization for the purpose of heating will save natural gas, prevent methane emissions from MSW decomposition, and improve the environment.

Substantiation of the selected project boundary	The project boundary was selected taking into account the scope of realistic project activities and effects of applied technologies on the GHG emission sources and GHG emission reductions. Within the project boundaries the project technologies will reduce emissions from boiler houses, emissions from CHP units, and emissions from the MSW landfill. Those emissions that are not under control of a project operator were considered the same as in the business-as-usual scenario: fuel extraction and transportation and emissions from power plants. **Project emissions within the project boundary were calculated with the following assumptions:** 1. The quality of services during the first commitment period 2008-2012 remains unchanged as in the basis year 2003 (See Annex 1, Annex 2, Annex 3). 2. Baseline emissions remain the same during years 2008-20012. (In the reality baseline will be dynamic due to the average annual outside temperature fluctuations, but for the ERUs calculations these parameters considered as fixed). 3. Baseline is dynamic and for each particular year it will depend on the factors to be fixed through monitoring: - Outside temperature - Heat-supply service area; - In-side temperature at customer's buildings - Availability of fuel; - Quality of the fuel (its Lower Heating Value)

Influencing factors can affect both the project scenario and the baseline scenario. Factors relevant for the project and their possible effects are to be stated. Examples are the energy policy of the host country, raw material prices etc. For details see e.g. the baseline study available at http://www.ji-cdm-austria.at or http://www.klimaschutzprojekte.at.

D 1.4 Influencing factors	
Legal influencing factors	Type of influencing factor Factor A: Sectoral reforms Relevance for the project Factor A: Declarations or pre-election promises regarding district heating sector reforms may be documented in the future as a social sphere priority actions to be addressed Expected development Factor A: Very unlikely that until 2012 this will happen in Crimea
Economic and political influencing factors	Type of influencing factor Factor A: Quality of service Factor B: Changes in the number of heat consumers Factor C: Fuel prices Factor D: Equipment prices

	Relevance for the project Factor A: Applicant will provide service of the same quality or even better quality. Changes in the quality of a service will effect baseline and project scenarios and consequently ERUs generation. Factor B: It the number of consumers will change significantly, e.g. population explosion, new consumers will be added to the DH system thus consumption of heat services will be increased Factor C: Fuel price skyrocketing without its proper reflection in heat tariffs may affect the economic activity of an Applicant, making fuel less available at some point for heat production. Though fuel price raising may also stimulate project implementation, since economic effect from fuel saving will be increased. Factor D: Equipment price change, which usually strictly follows the fuel price changes on fuel will increase cost of the project Expected development Factor A: It is assumed that natural gas will be available for 100%. It is unlikely that this factor will affect project or baseline scenario. Factor B: A number of consumers is not expected to grow drastically during project implementation and first commitment period Factor C: It is likely that fuel price may raise by the end of commitment period though no significant affect on baseline or project scenario it will have since district heating is a social issue and the enterprise must receive subsidy from the Government
Natural influencing factors	Type of influencing factor Factor A: Average outside temperature during heating season Factor B: Fuel quality Relevance for the project Factor A: The amount heat consumption strongly depends on weather conditions in the baseline scenario and in the project scenario Factor B: Changes in the lower heating value of fuels consumed affects the emission reductions Expected development Factor A: Average outside temperature will surely be different from year to year. This is an object for monitoring. For the ex-post ERU verification monitoring data will be used, for the ex-ante calculations it is assumed that weather conditions are the same during commitment period as in the basic 2003 year. Factor B: It is expected that fuel quality will not significantly change over time.
Technological influencing factors	Type of influencing factor Factor A: Claimed efficiency of applied technologies Relevance for the project Factor A: If the applied technologies will not achieve expected effect, project scenario emissions will be greater thus making ERUs lower

	Expected development Factor A: Efficiency of applied technologies must correspond with claims or guarantees of equipment producers

Please extend the table if multiple factors play a role.

D 2 PROJECT SCENARIO

D 2.1 Project emissions within the project boundary	
Emissions within the project boundary	☒ Emission 1 Source: Boiler houses and CHP units Type of emission: CO_2 emissions from boiler houses' and CHP unit's smokestacks ☒ Emission 2 Source: Landfill Type of emission: CH_4 (uncollected methane at the landfill) ☒ Emission 3 Source: Emergency flare for LFG, boiler house where LFG will be combusted Type of Emission: CO_2 (emissions from flare and boiler house at 66 Glynki Street)
	☐ No emissions within the project boundary

Leakage is (project-related) emissions occurring outside the project boundary. They are not under the direct influence of the project operator.

D 2.2 Leakage	
Leakage	☐ Leakage 1 Source: _____ Type of leakage: _____
	☒ No leakage

To calculate the project emissions the following data must be collected for each emission source:

1 fuel input in tonnes,

2 specific emission factors.

The emissions are calculated by multiplying the fuel input by the corresponding emission factors. For details see e.g. the baseline study available at http://www.ji-cdm-austria.at or http://www.klimaschutzprojekte.at.

D 2.3 Calculation of project emissions within the project boundary *(EB PDD E.1., EB PDD E.6.)*	

Emission 1	Emissions from natural gas-fired boilers oil fired boilers and CHP-units. LE Krymteplocommunenergo uses two types of fuel for heat production purposes: natural gas and oil. CO_2 emission factors (CEF) for all involved fuels originate from the IPCC (International Panel on Climate Change) 1996 'Revised Guidelines for National Greenhouse Gas Inventories' (www.ipcc.ch/pub/guide.htm). 1) CEF (natural gas) = 56.1 tCO_2/TJ; 2) CEF (oil) = 77.37 tCO_2/TJ 3) CEF (CH_4) = 55 t CO_2/TJ Average Lower Heating Values for these fuels (for Natural gas and oil – statistical data, for methane – taken from http://www.hyweb.de/Knowledge/w-i-energiew-eng2.html) are: 1) Average LHV of Natural Gas: Q_{ng} = 35.21 MJ/Nm^3; 2) Average LHV of Oil: Q_{oil} = 41.06 MJ/kg; 3) Average LHV of CH_4: Q_{CH4} = 35.9 MJ/Nm^3. Thus CO_2 conversion factor (CF) for Natural Gas and Oil combustion are: 1000 m^3 of natural gas input = 35.21[GJ/1000Nm^3] * 0.0561[t CO_2/GJ] = 1.975 tCO_2 1 t of oil input = 41.06 [GJ/t] * 0.07737 [t CO_2/GJ] = 3.177 t CO_2 1000 m^3 of methane = 35.9 [GJ/1000Nm^3] * 0.055 [t CO_2/GJ] = 1.975 t CO_2 Project scenario emissions from boiler houses and new CHP units includes are a sum of actual natural gas and oil to be used in any report year (starting from 2008) multiplied by corresponding emission factors. Actual – means with subtracted fuel saving due to network efficiency and fuel replacement by LFG: 1) Project natural gas consumption after boiler rehabilitation and replacement, fuel switch, and installation of CHP units: 241,001.28 ths m^3 (Annex 1, Sheet Boilers) 2) Project oil consumption after the same measures: 5,755.48 t (Annex 1, Sheet Boilers); 3) Project natural gas saving due to network efficiency: 5,930.94 ths m^3 (Annex 2, Sheet Networks); 4) Project oil saving due to network efficiency: 429.77 t (Annex 2, Sheet Networks). 5) Project Natural gas saving due to its replacement by landfill gas: 3,780 ths m3 (Annex 3, Sheet LFG utilization); Emissions from boiler houses and CHP units in Project Scenario: E1 = (241,001.28 – 5,930.94 – 3,780)*CF_ng + (5,755.48 – 429.77)*CF_oil = = (231,290.34)*1.975 + (5,325.71)*3.177 = 456,843.41 + 16,918.78 = **473,762.2 t CO_2e**. (See Annex 1 and Annex 2, Annex 3 for details).

Emission 2	Methane emissions from landfill which are not foreseen to be collected in the project. A half of landfill gas will be utilized, while another half will be emitted to the atmosphere. Only methane emitted into the atmosphere is taken into account: 1) Methane's density = 0.7168 kg/m^3 (from ACM001); 2) GWP (CH_4) = 21(ACM001). E2 = 3,710.7 ths. m^3 of CH_4 = 3,710.7 (ths.m^3) * 0.7168 (kg/m^3) * 21 = **55,856.42 t CO_2e.**
Emission 3	Emissions from LFG-fired boilers at 66 Glynki Street in Simferopol: 1) Methane's density = 0.7168 kg/m^3 (from ACM001); 2) Conversion of masses CH_4 into CO_2 based on molar masses ratio = 44/16 = 2.75. E3 = 3,710.7*0.7168*2.75 = **7,314.53 t CO_2e.** (See Annex 1 for details).
Total Project Emissions	**E = E1 + E2 + E3 =** 473,762.2 + 55,856.42 + 7,314.53 = **536,933.15 t CO_2e**

Please include a description of the formulae used to estimate anthropogenic emissions by sources of greenhouse gases of the project activity within the project boundary (for each gas, source, formulae/algorithm, emissions in units of CO_2 equivalent).

D 2.4 Calculation of leakage emissions ***(EB PDD E.2., EB PDD E.6.)***	
Leakage 1	No leakeage is expected.

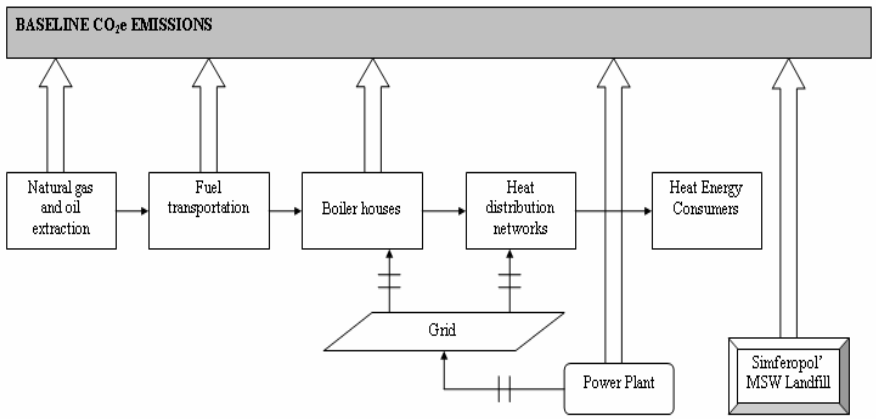
Please include a description of the formulae used to estimate leakage, defined as: the net change of anthropogenic emissions by sources of greenhouse gases which occurs outside the project boundary, and that is measurable and attributable to the project activity (for each gas, source, formulae/algorithm, emissions in units of CO_2 equivalent).

D 2.5 Calculation of total project activity emissions ***(EB PDD E.3., EB PDD E.6.)***						
	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012	Σ 2008-12
Emissions (in t CO_2/year)	536,933	536,933	536,933	536,933	536,933	2,684,665
Leakage (in t CO_2/year)	0	0	0	0	0	0

Total emissions (in t CO_2/year)	536,933	536,933	536,933	536,933	536,933	2,684,665

D 3 BASELINE SCENARIO

Baseline methodology refers to the methods used to determine the baseline emissions. The division of the project into various subcomponents could serve the selection of a baseline methodology. For details see e.g. the baseline study available at http://www.ji-cdm-austria.at or http://www.klimaschutzprojekte.at.

D 3.1 Baseline methodology	
Description of the selected methodology and justification of the choice of the methodology and why it is applicable to the project activity ***(EB PDD B.2.)*** *If an approved methodology is chosen, please indicate the title and reference of the methodology applied to the project activity.*[3] ***(EB PDD B.1.)***	 The methodology applied for this project is similar to the one used in JI Project "District heating system rehabilitation of Chernigiv Region", submitted to Dutch ERUPT-4, and validated by TUEV-IS. Elements of landfill gas utilization methodology are the similar to what was used for JI Project "Methane Capture at the Odesa MSW Landfill", submitted to Dutch ERUPT-5. Baseline is represented by business-as-usual emissions from all sources of GHGs operated by an Applicant in present time. Baseline emissions include: emissions from boiler houses, emissions due to electricity consumption from the grid, which will be replaced after installation of CHP-units, and emissions of methane (CH_4) from Simferopol city landfill. Baseline calculations were based on the following assumptions: 1. Baseline emissions during any report year (2008-20012) remain the same as in the basis year 2003. 2. Baseline calculation for each report year until 2012 must be adjusted to influencing factors that are not under control of an Applicant. The baseline for this project is dynamic for all report years. For each report year it depends on the factors to be fixed by monitoring: - Outside temperature - Heat-supply service area; - In-side temperature at customer's buildings - Quality of the fuel (its Lower Heating Value) Description of Energy Efficiency Methodology (Annex 1, and Annex 2): For every boiler operated by an LE Krymteplocomunenergo, which is involved in the rehabilitation plans statistical data on the efficiency and annual fuel consumption (FC) within

[3] If a new baseline methodology shall be applied to a CDM project activity, a special procedure has to be observed. For details please refer to http://cdm.unfccc.int/.

	the basis year 2003 is presented in Annex 1. Baseline GHG emissions represented by emissions of CO_2 emitted from boiler house smokestacks after fuel combustion, LFG emissions from Simferopol's MSW landfill, and emissions due to electricity consumption from the grid, which will be generated after installation of CHP units. LE "Krymteplocommunenergo" uses two types of fuel for heat production purposes: natural gas and oil. Baseline emissions from the MSW landfill were calculated using elements of following methodology**: ACM0001 "Consolidated baseline methodology for landfill gas project activities".** **Justification of the choice of the methodology and why it is applicable to the project activity:** The chosen methodology is designed for landfill gas capture project activities, where the baseline scenario is full atmospheric release of the landfill gas. The captured gas is used for energy production, but no emission reductions are claimed for displacing energy from other sources, or captured LFG is flared. The conditions for the methodology to be applicable are respected: Concerning Ukraine: - There is no national framework governing landfilling; - There is no capture or destruction of methane at the landfill in Simferopol. Full atmospheric release of landfill gas is thus taken as the baseline for the proposed project - There is no consideration of energy exports to claimed emissions reduction - The captured gas will be supplied to the boiler house and converted into energy. In situations of technical failures in the boiler house, extracted gas will be flared - At present controlled extraction of the landfill gas does not occur in Ukraine. Due to the economical situation in the country, there is a lack of financial means to invest in modernization of the waste management. It can therefore be concluded, that the project is additional.
Description of how the methodology is applied in the context of the project activity ***(EB PDD B.3.)***	The methodology allows making accurate calculation of GHG emissions reductions by each source operated by an Applicant. For every source of GHG emissions available data were collected and/or estimated (e.g. for every boiler house emissions were calculated by multiplication of fuel consumption by emission factor of a fuel consumed). Project activity is an application of fuel saving and emission reduction technologies which substantially changes business-as-usual emissions of LE "Krymteplocomunenergo" – the Applicant.

Different scenarios can be used for each methodology.

D 3.2 Identification of different baseline scenarios	
Baseline Scenario 1	Baseline scenario in the chosen methodology is a business-as-usual scenario with minimum reconstruction works balanced by overall degradation of DH system. GHGs emissions level is stable. There are 3 types of GHG emissions involved in the baseline scenario 1) CO_2 emissions from boilers operated by the Applicant 2) CH_4 emissions from the MSW landfill 3) CO_2 emissions due to electricity consumption from the grid, which will be

	replaced after installation of CHP units
Baseline Scenario 2	Alternative baseline scenario is elimination of landfill from the project. This makes project economically less attractive, since landfill may provide about 40% of emission reduction units.

Every suggested scenario has to be justified.

D 3.3 Selected baseline scenario	
Description of the selected baseline scenario and substantiation of the selection	Baseline scenario is a sum of GHG emissions from all sources operated by the Applicant including Simferopol MSW landfill. Baseline includes: 1) emissions from boiler houses operated by Applicant, 2) emissions of methane from the Simferopol MSW landfill operated by Applicant, 3) emissions due to electricity consumption from the grid that will be replaced after installation of 6 CHP units. The basis year for baseline calculation is 2003. Land filling is a preferred method for treating domestic waste in Ukraine, mainly due to the availability of vast extensions of land. A large part of solid waste is going however into uncontrolled open air dumps and leaching pits that leaches into the aquifers. Selection of deposed waste does not occur. Enforcing the existing regulatory framework would lead to significant reduction of the negative impact of the landfill on environment. However, because of poor economic situation in Ukraine, it is not expected that full compliance with the existing regulatory framework is feasible in the short term. The only least cost option for the Simferopol landfill is releasing LFG to the atmosphere.

D 3.4 Baseline description	
Was a new baseline developed for the project?	☒ Yes ☐ No
Was an existing baseline used or adapted for the project?	☒ Yes: fuel consumption statistics carried out by Applicant on yearly basis. Landfill data collected by SEC "Biomass" during on-site visiting. (*State sources and matters used.)* ☐ No
Is it planned to update the baseline during the project lifetime?	☒ Yes ☐ No

D 3.5 Baseline emissions	

within the project boundary	
Emissions within the project boundary	☒ Emission 1 Source: Boiler houses Type of emission: CO_2 ☒ Emission 2 Source: MSW landfill Type of emission: CH_4 ☒ Emission 3 Source: Grid Type of emission: CO_2e
	☐ No emissions within the project boundary

D 3.6 Leakage	
Leakage	☐ Leakage 1 Source: _____ Type of leakage: _____ ☐ Leakage 2 Source: _____ Type of leakage: _____
	☒ No leakage

To calculate the baseline emissions the following data must be collected for each emission source:

1 fuel input in tonnes,

2 specific emission factors.

The emissions are calculated by multiplying the fuel input by the corresponding emission factors. For details see e.g. the baseline study available at http://www.ji-cdm-austria.at or http://www.klimaschutzprojekte.at.

D 3.7 Calculation of baseline emissions *(EB PDD E.4., EB PDD E.6.)*	

Emission 1	Emissions from boiler houses: CO_2 emission factors (CEF) for natural gas, oil, and methane originate from the IPCC (International Panel on Climate Change) 1996 'Revised Guidelines for National Greenhouse Gas Inventories' (www.ipcc.ch/pub/guide.htm). 1) CEF (natural gas) = 56.1 tCO_2/TJ; 2) CEF (oil) = 77.4 tCO_2/TJ 3) CEF (CH_4) = 55 t CO_2/TJ Average Lower Heating Values for these fuels (for Natural gas and oil – statistical data, for methane – taken from http://www.hyweb.de/Knowledge/w-i-energiew-eng2.html) are: 1) Average LHV of Natural Gas: Q_{ng} = 35.21 MJ/Nm^3; 2) Average LHV of Oil: Q_{oil} = 41.06 MJ/kg; 3) Average LHV of CH_4: Q_{CH4} = 35.9 MJ/Nm^3. Thus CO_2 conversion factor (CF) for Natural Gas and Oil combustion are: 1000 m^3 of natural gas input = 35.21[GJ/1000Nm^3] * 0.0561[t CO_2/GJ] = 1.975 tCO_2 1 t of oil input = 41.06 [GJ/t] * 0.07737 [t CO_2/GJ] = 3.177 t CO_2 1000 m^3 of methane = 35.9 [GJ/1000Nm^3] * 0.055 [t CO_2/GJ] = 1.975 t CO_2 Baseline GHGs emissions (BLE) from heat generating sources operated by an Applicant: 1) Natural gas consumption emissions: BLE_{ng} = FC_{ng} * CF_{ng} = FC * Average LHV_{ng} * *CEF_{ng} = 249,985.9 [1000 Nm^3] * 35.21 [GJ/1000Nm^3] * 0.0561 [t CO_2/GJ] = **493,792.4 t CO_2**; 2) Oil consumption emissions: BLE_{oil} = FC_{oil} * CF_{oil} = FC * Average LHV_{ng}*CEF_{ng} = = 22,597 [t] * 41.06 [GJ/t] * 0.07737 [t CO_2/GJ] = **71,786 t CO_2** ; Baseline emissions from boiler houses in the basis year (2003): E1 = **565,578.4 t CO_2eq t CO_2eq**. (For details, see Annex 1).
Emission 2	Baseline emissions from Simferopol MSW landfill: 1) Methane's density = 0.7168 kg/m^3 (Source: ACM001); 2) GWP (CH_4) = 21(Source: ACM001). E2 = 7,421.4*0.7168*21 = **111,712.8 t CO_2eq** (For Details see Annex 3):
Emission 3	Baseline emissions due to electricity consumption: Carbon Emission factors for electricity generation in Ukraine (factors for 2008-2012 are taken from Table B1 "Baseline carbon emission factors for JI projects generating electricity" of operational Guidelines for PDD's of JI projects (ERUPT 4, Senter, the Netherlands). Average factor for 2008-2009 = 0.666 [t CO_2e/MWh]: Annual consumption capacity = 3 [MWe] * 8400 [h/yr] = 25,200 MWh/yr; E3 = Electric Capacity * CEF_ electricity generation = 25,200*0.666 = **16,783 t CO_2e**
Total Baseline Emissions	BLE = **694,074.4 t CO_2eq**.

Please describe the formulae used to estimate the anthropogenic emissions by sources of greenhouse gases of the baseline (for each gas, source, formulae/algorithm, emissions in units of CO_2 equivalent).

D 3.8 Calculation of leakage emissions	
Leakage 1	No leakage is expected. Dynamic baseline (based on collected monitoring data) will exclude all possible leakages.
Leakage 2	

Please present the calculation including the basis and method of calculation

D 3.9 Calculation of total baseline emissions ***(EB PDD E.6.)***						
	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012	Σ 2008-12
Emissions (in t CO_2/year)	694,074	694,074	694,074	694,074	694,074	3,470,372
Leakage (in t CO_2/year)	0	0	0	0	0	0
Total emissions (in t CO_2/year)	694,074	694,074	694,074	694,074	694,074	3,470,372

D 4 EMISSION REDUCTIONS

D 4.1 Expected emission reductions ***(EB PDD E.5., EB PDD E.6.)***						
	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012	Σ 2008-12
Expected total project emissions (in t CO_2/year)	536,933	536,933	536,933	536,933	536,933	2,684,665
Expected total baseline emissions (in t CO_2/year)	694,074	694,074	694,074	694,074	694,074	3,470,372
Expected total emission reductions (in t CO_2/year)	157,141	157,141	157,141	157,141	157,141	785,705

D 4.2 Sensitivity analysis	
Sensitivity analysis *A sensitivity analysis illustrating the effects of the variation of the influencing factors described in D 1.4. is to be enclosed.*	Two factors described in D.1.4 may seriously influence ERUs generation over the commitment period: weather conditions and service quality improvement. **1. Natural factor – weather condition variations or changes in the outside temperature (Annex 4).** Fuel consumption directly related to the outside temperature, or more precisely, to the difference between outside and inside temperature. The colder the weather outside – the more fuel must be used to keep the inside temperature at an acceptable level. In our calculations we assume that the inside temperature remains the same, that is service quality remains the same during years. Delivered heat : $Q = k*F*(Tin - Tout)$, [kW]; (Also Q = Fuel Consumption * LHV * Efficiency of Heat Generating Equipment) Where, k – heat conducting rate, (kW/m^2*K) – const; F – heating area, m^2 – const; Tin – temperature inside, ^0C – const; Tout – temperature outside, ^0C. Thus, in the basis year and in the report year delivered heat will be represented as follows: $Q_b = k*F*(Tin_b - Tout_b)$ $Q_r = k*F*(Tin_r - Tout_r)$ So, $Q_b/Q_r = (Tin_b - Tout_b)/ (Tin_r - Tout_r) = \Delta T_b/\Delta T_r$ or $FC_b/FC_r = \Delta T_b/\Delta T_r$ Fuel consumption directly related to temperature changes. Now, lets model the situation and see how ERUs generation is effected when the report year weather conditions vary from the basis (2003) year conditions: That is $\Delta T_b/\Delta T_r = 1.05$, and $\Delta T_b/\Delta T_r = 0.95$; correspondingly $FC_b/FC_r = 1.05$ and $FC_b/FC_r = 0.95$. **2. Service quality improvement (Annex 4).** Service quality improvement strongly related to fuel consumption. The more fuel consumed the better service quality is and the more CO_2 emissions. In analysis we modeled the situation when in the project scenario the Applicant voluntarily improved service quality by 5%. **3. Worst case – weather is warmer and Applicant voluntarily improves service quality by 5% (Annex 4).**

D 4.3 Additionality	
Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the project activity *Please explain, how and why this project is additional and therefore not the baseline scenario.* *For analysing the additionality of a project please take into account the relevant decisions of the Executive Board[4] (e.g. EB 10 Report, Annex 1[5]).* ***(EB PDD B.4.)***	The anthropogenic emissions of GHG will be reduced due to application of technologies proposed in the project activities, which include: 1) Complex modernization of heat generating and distribution equipment (replacement of outmoded boilers by new ones with higher efficacy, installation of new burners, heat-utilizers, installation of niche flow burners, replacement of heat-exchangers at Central Heating Points, replacement of 43 km of degraded heat distribution networks by pre-insulated pipes); 2) Installation of cogeneration gas engines (CHP units) for electricity production for Applicant's own needs; 3) Installation of landfill gas extraction system at MSW landfill for its further utilization at the nearest boiler house. These measures will reduce methane emissions from landfill, and replace certain amount of natural gas. All proposed project activities if applied together will substantially reduce fuel and electricity consumption by Applicant's boiler houses, and abate methane emissions from the landfill. The project's additionality can be explained as follows: All project activities require substantial investment. Without carbon credits sales the project is not economically favorable for an Applicant, which makes implementation of most activities impossible. More economically feasible and realistic scenario without carbon credits sales is a baseline scenario with very slow reconstruction activities (maybe 1-2 boiler houses per year at each district). However, considering degradation of the whole system with efficiency droop at other objects, overall actual emissions of an Applicant would stay on the same level. This scenario is less environmentally favorable for the near future (including first commitment period 2008-2012), since GHGs emissions of an Applicant will continue to be kept at the same level or even higher, but economically such scenario is more attractive. Sooner implementation of project activities (until 2008) requires substantial expenditures, but also provides substantial GHG emission reductions, and makes project additional.

E Monitoring Methodology and Plan

Emission reductions can only be acknowledged when these are proved by traceable monitoring of the project activities and emissions.

[4] Cp. http://cdm.unfccc.int/EB/.

[5] Cp. http://cdm.unfccc.int/EB/Meetings/010/eb10repan1.pdf.

Since the monitoring plan should document the actually achieved emission reductions as well as significant additional ecological, socio-economic and development effects it can only be filled in after the project has already been implemented. No differentiation is made between a JI and CDM project regarding the structure of the monitoring plan. Specific regulations are however applicable to CDM small-scale projects. The EB prepared a monitoring template for small-scale projects (SSC) which is available at http://unfccc.int/cdm/.

The monitoring reports must be delivered by the contractual party to an independent verification entity (IE or OE) at regular intervals. This entity examines the reports. Monitoring data must be kept for at least 2 years after the end of the crediting period or the last transfer of ERUs or CERs.

Details of theoretical fundamentals of the monitoring are described in part 1 of the guide.

The monitoring plan encompasses the following five areas:

1. development of the monitoring plan and methodology,
2. organisation and procedures of monitoring regarding the calculation of ERUs/CERs,
3. review of significant additional ecological, socio-economic and development effects of the project,
4. quality assurance,
5. responsibilities.

E 1 DEVELOPMENT AND METHODOLOGY

E 1.1 Details of monitoring plan development	
Name and address of person/entity determining the monitoring methodology *Please provide contact information and indicate if the person/entity is also a project participant.* ***(EB PDD D.7.)***	Scientific Engineering Center "Biomass" – developer of monitoring methodology and a project developer Contact person: Mr. Alexander Filonenko – Consultant 2A, Zhelyabov str., 03057, Kyiv, Ukraine tel. +(38 044) 456 94 62; fax: +(38 044) 456 94 62 filonenko@biomass.kiev.ua
Date of completing the final draft of the monitoring plan (DD/MM/YYYY)	11/07/2005

The following description and substantiation of the monitoring methods used is mandatory for CDM projects. Authorised methods are available at http://unfccc.int/cdm/. New methods are to be substantiated and submitted to the EB for appraisal (in the case of CDM projects).

E 1.2 Approved methodology	
Name and reference of approved	Monitoring methodology to be used for this project is similar to the one elaborated for

methodology applied to the project activity *If a national or international monitoring standard has to be applied to monitor certain aspects of the project activity, please identify this standard and provide a reference to the source where a detailed description of the standard can be found.* ***(EB PDD D.1.)***	JI Project "Rehabilitation of the District Heating System of Chernigiv". (Annex 6).
Justification of the choice of the methodology and why it is applicable to the project activity ***(EB PDD D.2.)***	

E 2 CALCULATION OF ERUS OR CERS

In order to determine the actual emission reductions generated by the project the monitoring plan is based on the baseline study.

Project emissions

E 2.1.1 Data relevant for monitoring project emissions ***(EB PDD D.3.)***	
ID number *Please use numbers to ease cross-referencing.*	ID 1 - Emission 1 (see table D 2.1.)
Data type	Direct.
Data variable	Quantity of natural gas consumed by boiler houses and CHP units. Amount of oil (mazut) consumed by boiler houses.
Data unit	m^3 for natural gas, tons for oil.
Data quality	Measurement ☒ Yes: (1) Quantity of natural gas consumed by boiler houses and CHP units will be measured by gas flow meters. Gas flow meter will be installed inside of each boiler house and before each CHP unit. Data quality is ensured by gas flow-meter accuracy, which by regulation must be > 99%. ☒ (2) Quantity of oil measured by calibrated stick putted into the oil tank. (*State how the measurement is performed and the data quality ensured.)*

	☐ No Calculation ☒ Yes: Total quantity of consumed fuel will be calculated in the central office of by Production and Technical Department of LE "Krymteplocomunenergo" *(State how the calculation is performed.)* ☐ No Estimate ☐ Yes: _____ *(State which assumptions the estimate is based on and how it is performed.)* ☒ No
Recording frequency	Every month
Proportion of data to be monitored	100%
How will the data be archived?	☒ Electronic ☒ In paper form
For how long is archived data to be kept?	10 years
Comment	The data on natural gas consumption will be collected from gas flow meter indicators; Total sum of natural gas quantity consumed can be cross-checked by Applicant's expenditures reports. The data on oil consumption will be collected at each boiler house by operators every day, and the sum will reported to the central office every month. Instrument for oil consumption data collection is a calibrated stick.

E 2.1.2 Data relevant for monitoring project emissions ***(EB PDD D.3.)***	
ID number *Please use numbers to ease cross-referencing.*	ID 2 - Emission 2 (see table D 2.1.)
Data type	Indirect.

Data variable	Quantity of methane emitted by landfill as a difference between total (estimated) generated methane by landfill and amount of utilized methane; Concentration of methane in the LFG.
Data unit	m^3;
Data quality	Measurement ☐ Yes: _____ (*State how the measurement is performed and the data quality ensured.)* ☒ No Calculation ☒ Yes: Total estimated quantity of landfill methane minus measured quantity of utilized methane from landfill *(State how the calculation is performed.)* ☐ No Estimate ☐ Yes: _____ *(State which assumptions the estimate is based on and how it is performed.)* ☒ No
Recording frequency	Every day.
Proportion of data to be monitored	50%
How will the data be archived?	☒ Electronic ☒ In paper form
For how long is archived data to be kept?	10 years
Comment	Estimation of landfill emissions for each report year will be done by project developer. Measurement of utilized methane will be calculated by project operator (landfill operator) who will measure the LFG flow by flow meters, and store data on paper, gas analyzer will be installed to measure the content of methane in the LFG. Accuracy of gas analyzer and accuracy of flow meter will ensure the data quality on utilized landfill gas.

E 2.1.3 Data relevant for monitoring project	

emissions ***(EB PDD D.3.)***	
ID number *Please use numbers to ease cross-referencing.*	ID 3 - Emission 3 (see table D 2.1.)
Data type	Direct.
Data variable	Quantity of landfill gas (methane) consumed by boiler house at 66 Glynki str., and quantity of landfill gas flared.
Data unit	m^3 of LFG; % of CH_4.
Data quality	Measurement ☒ Yes: (1) Quantity of landfill gas consumed by boiler house at 66 Glynki Str. will be measured by gas flow meter. Methane content will be measured by gas analyzer. Data quality is ensured by gas flow-meter accuracy, and gas analyzer. Both apparatuses will have accuracy > or = 99%. ☒ (2) Quantity of landfill gas flared on emergency flare. The quantity of landfill gas flared will be measured by flow meter. Methane content will be measured by gas analyzer. ☒ (*State how the measurement is performed and the data quality ensured.)* ☐ No Calculation ☒ Yes: (1) Quantity of methane combusted at 66 Glynki Str. Boiler house will be calculated as a product of landfill gas quantity (measured) and percentage of methane in LFG (measured); (2) the same calculation applied to flared methane (measured quantity of LFG multiplied by measured methane content). *(State how the calculation is performed.)* ☐ No Estimate ☐ Yes: _____ *(State which assumptions the estimate is based on and how it is performed.)* ☒ No
Recording frequency	Every day on the paper
Proportion of data to be monitored	100%

How will the data be archived?	☒ Electronic ☒ In paper form
For how long is archived data to be kept?	10 years
Comment	

The table is to be filled in separately for each data type and should therefore be copied as often as required.

E 2.2 Data relevant for monitoring leakage ***(EB PDD D.4.)***	
ID number *Please use numbers to ease cross-referencing.*	Leakage is not expected.
Data type	
Data variable	
Data unit	
Data quality	Measurement ☐ Yes: _____ (*State how the measurement is performed and the data quality ensured.)* ☐ No Calculation ☐ Yes: _____ *(State how the calculation is performed.)* ☐ No Estimate ☐ Yes: _____ *(State which assumptions the estimate is based on and how it is performed.)* ☐ No
Recording frequency	
Proportion of data to be	

monitored	
How will the data be archived?	☐ Electronic ☐ In paper form
For how long is archived data to be kept?	
Comment	

The table is to be filled in separately for each data type and should therefore be copied as often as required.

Baseline emissions

Depending on the methodology used to determine the baseline the following tables may need to be filled in.

E 2.3.1 Data relevant for monitoring baseline emissions ***(EB PDD D.5.)***	
ID number *Please use numbers to ease cross-referencing.*	ID 4 - Emission 2 (Table D.3.5.)
Data type	MSW landfill methane emissions.
Data variable	Methane emissions.
Data unit	m^3.
Data quality *(If no data will be collected on this item, please explain the reason.)*	Measurement ☐ Yes: _____ (*State how the measurement is performed and the data quality ensured.)* ☐ No Calculation ☐ Yes: _____ *(State how the calculation is performed.)* ☐ No Estimate ☒ Yes: Landfill data collected by SEC "Biomass" during on-site visiting. Estimate

	of landfill methane emissions was based on collected data on morphological contents of MSW, daily deposition (in tons), years of landfill operation, depth of the landfill, area to be used for the project, LFG collection efficiency, conservative estimated CH_4 content - 50%. References for annual estimates of LFG generation given in the Annex 3. *(State which assumptions the estimate is based on and how it is performed.)* ☐ No
Recording frequency	n/a. The data on landfill methane emissions will be linked with the amount of biogas to be captured and utilized.
Proportion of data to be monitored	50%
How is data archived?	☐ Electronic ☐ In paper form
For how long is data archived to be kept?	n/a.
Comment	Estimate of baseline methane emissions from the landfill does not really effect ERUs calculation accuracy. The only parameters that matter are actual methane quantity to be utilized at boiler house and to be combusted on the flare (both are measured).

E 2.3.2 Data relevant for monitoring baseline emissions ***(EB PDD D.5.)***	
ID number *Please use numbers to ease cross-referencing.*	ID 5 - Emission 3 (Table D.3.5.)
Data type	Electric capacity generated by CHP units.
Data variable	Baseline emissions due to electricity consumption from the grid, to be replaced by own electricity produced by CHP units for own needs.
Data unit	kWh.
Data quality *(If no data will be collected on this item, please explain the reason.)*	Measurement ☒ Yes: Measurement will be performed automatically by electricity meters installed at each CHP unit. The data quality will be ensured by electricity meters accuracy, which usually = or > 99%. (*State how the measurement is performed and the data quality ensured.)* ☐ No

	Calculation ☒ Yes: Total generated electric capacity will be calculated as a sum. *(State how the calculation is performed.)* ☐ No Estimate ☐ Yes: _____ *(State which assumptions the estimate is based on and how it is performed.)* ☒ No
Recording frequency	Every month.
Proportion of data to be monitored	100%
How is data archived?	☒ Electronic ☒ In paper form
For how long is data archived to be kept?	10 years.
Comment	

E 2.3.3 Data relevant for monitoring baseline emissions ***(EB PDD D.5.)***	
ID number *Please use numbers to ease cross-referencing.*	ID 6 (See, D.3.1.)
Data type	Auxiliary data
Data variable	Daily outside temperature in the heating season.
Data unit	^{0}C.
Data quality *(If no data will be collected on this item, please explain the reason.)*	Measurement ☒ Yes: Measurement will be performed by thermometers, which are installed outside of each boiler house. This data have been collected for each day of former heating seasons. Quality will be ensured by thermometer accuracy = or > 99%. (*State how the measurement is performed and the data quality ensured.)*

	☐ No Calculation ☐ Yes: _____ *(State how the calculation is performed.)* ☒ No Estimate ☐ Yes: _____ *(State which assumptions the estimate is based on and how it is performed.)* ☒ No
Recording frequency	Every day.
Proportion of data to be monitored	100%
How is data archived?	☒ Electronic ☒ In paper form
For how long is data archived to be kept?	10 years.
Comment	Outside temperature is an auxiliary data which allows correcting baseline and project scenario

E 2.3.4 Data relevant for monitoring baseline emissions ***(EB PDD D.5.)***	
ID number *Please use numbers to ease cross-referencing.*	ID 7 (See, D.3.1.)
Data type	Auxiliary
Data variable	Average inside temperature in the heating season.
Data unit	^{0}C.
Data quality *(If no data will be collected on this item, please explain the reason.)*	Measurement ☒ Yes: Measurement will be performed by thermometers, which are installed at each boiler house and reference apartments (where usually boiler house operators live). Quality will be ensured by thermometer accuracy = or > 99%.

	(*State how the measurement is performed and the data quality ensured.)* ☐ No Calculation ☐ Yes: _____ *(State how the calculation is performed.)* ☒ No Estimate ☐ Yes: _____ *(State which assumptions the estimate is based on and how it is performed.)* ☒ No
Recording frequency	Every day.
Proportion of data to be monitored	100%
How is data archived?	☒ Electronic ☒ In paper form
For how long is data archived to be kept?	10 years.
Comment	Inside temperature is an auxiliary data which allows correcting baseline and project scenario

E 2.3.5 Data relevant for monitoring baseline emissions ***(EB PDD D.5.)***	
ID number *Please use numbers to ease cross-referencing.*	ID 8 (See, D.3.1.)
Data type	Auxiliary
Data variable	Average lower heating values of natural gas and oil.
Data unit	MJ/m^3 – for natural gas; MJ/t – for oil.
Data quality *(If no data will be collected on this item, please explain the reason.)*	Measurement ☒ Yes: LHV of natural gas is measured by chemical laboratories of natural gas suppliers every 10 days. LHV of oil is measured by chemical laboratories of oil

	suppliers. Suppliers of oil provide this data with oil purchasing contract. (*State how the measurement is performed and the data quality ensured.)* ☐ No Calculation ☐ Yes: _____ *(State how the calculation is performed.)* ☒ No Estimate ☐ Yes: _____ *(State which assumptions the estimate is based on and how it is performed.)* ☒ No
Recording frequency	Every 10 days for natural gas; every season for oil.
Proportion of data to be monitored	100%
How is data archived?	☒ Electronic ☒ In paper form
For how long is data archived to be kept?	10 years.
Comment	LHV of fuel is an auxiliary data which allows correcting baseline and project scenario.

E 2.3.6 Data relevant for monitoring baseline emissions ***(EB PDD D.5.)***	
ID number *Please use numbers to ease cross-referencing.*	ID 9 (See, D.3.1.)
Data type	Auxiliary
Data variable	Quantity of customers or heating area
Data unit	m^2
Data quality *(If no data will be collected on this item, please explain the reason.)*	Measurement ☐ Yes: _____. (*State how the measurement is performed and the data quality ensured.)*

	☒ No Calculation ☒ Yes: Before every season the heating area is rechecked. New customers who connected to the network and customers who disconnected from the network operated by Applicant reflected by this parameter. Total area almost doesn't change from year to year. Planning department of an Applicant keeps record of this data. *(State how the calculation is performed.)* ☐ No Estimate ☐ Yes: _____ *(State which assumptions the estimate is based on and how it is performed.)* ☒ No
Recording frequency	Every heating season.
Proportion of data to be monitored	100%
How is data archived?	☒ Electronic ☐ In paper form
For how long is data archived to be kept?	1 year.
Comment	Heating area is an auxiliary data which allows correcting baseline and project scenario.

The table is to be filled in separately for each data type and should therefore be copied as often as required.

E 2.4 Data relevant for monitoring leakage	
ID number *Please use numbers to ease cross-referencing.*	Leakage is not expected.
Data type	
Data variable	
Data unit	

Data quality *(If no data will be collected on this item, please explain the reason.)*	Measurement ☐ Yes: _____ (*State how the measurement is performed and the data quality ensured.)* ☐ No Calculation ☐ Yes: _____ *(State how the calculation is performed.)* ☐ No Estimate ☐ Yes: _____ *(State which assumptions the estimate is based on and how it is performed.)* ☐ No
Recording frequency	
Proportion of data to be monitored	
How will the data be archived?	☐ Electronic ☐ In paper form
For how long is archived data to be kept?	
Comment	

The table is to be filled in separately for each data type and should therefore be copied as often as required.

Emission reductions

E 2.5 Emission reductions	
Calculation of emission reductions	Baseline GHG emission reductions – Project emission reductions = ERUs.

E 3 ECOLOGICAL, SOCIO-ECONOMIC AND DEVELOPMENT EFFECTS

A monitoring plan is to be created for major ecological, socio-economic and development effects of the project. If applicable, the following table shall be used.

E 3.1 Data relevant for monitoring ecological, socio-economic and development effects of the project	
ID number *Please use numbers to ease cross-referencing.*	ID 10
Data type	Indirect.
Data variable	Saving of natural gas and oil.
Data unit	m^3 for natural gas, tons for oil.
Data quality	Measurement ☐ Yes: _____ (*State how the measurement is performed and the data quality ensured.)* ☒ No Calculation ☒ Yes: Difference between fuel consumption in baseline and project scenarios. *(State how the calculation is performed.)* ☐ No Estimate ☐ Yes: _____ *(State which assumptions the estimate is based on and how it is performed.)* ☒ No
Recording frequency	n/a.
Proportion of data to be monitored	50%
How will the data be archived?	☒ Electronic ☐ In paper form
For how long is data archived to be kept?	10 years

Comment	Fuel saving is indirect measurement of sustainability. These data also show proportion of NOx, SOx, particulate matter, that are not emitted in project scenario.

E 3.2 Data relevant for monitoring ecological, socio-economic and development effects of the project	
ID number *Please use numbers to ease cross-referencing.*	ID 3 - Emission 3 (see table D 2.1.)
Data type	Direct.
Data variable	Quantity of landfill gas (methane) consumed by boiler house at 66 Glynki str., and quantity of landfill gas flared.
Data unit	m^3 of LFG; % of CH_4.
Data quality	Measurement ☒ Yes: (1) Quantity of landfill gas consumed by boiler house at 66 Glynki Str. will be measured by gas flow meter. Methane content will be measured by gas analyzer. Data quality is ensured by gas flow-meter accuracy, and gas analyzer. Both apparatuses will have accuracy > or = 99%. ☒ (2) Quantity of landfill gas flared on emergency flare. The quantity of landfill gas flared will be measured by flow meter. Methane content will be measured by gas analyzer. ☒ (*State how the measurement is performed and the data quality ensured.)* ☐ No Calculation ☒ Yes: (1) Quantity of methane combusted at 66 Glynki Str. Boiler house will be calculated as a product of landfill gas quantity (measured) and percentage of methane in LFG (measured); (2) the same calculation applied to flared methane (measured quantity of LFG multiplied by measured methane content). *(State how the calculation is performed.)* ☐ No Estimate ☐ Yes: _____ *(State which assumptions the estimate is based on and how it is*

	performed.) ☒ No
Recording frequency	Every day on the paper
Proportion of data to be monitored	100%
How will the data be archived?	☒ Electronic ☒ In paper form
For how long is data archived to be kept?	10 years
Comment	Amount of landfill methane captured and utilized is also an indirect indicator of sustainability. First of all it allows replacing natural gas. Secondly, it indicates the amount of methane unreleased in the atmosphere. Thirdly, it indirectly shows reduction of other environmental pollutants (such as NMOC – non-methane organic compounds) connected with the landfill. Fourthly, research shows that combustion of landfill gas instead of natural gas reduces NOx emissions approximately by half.

The table is to be filled in separately for each data type and should therefore be copied as often as required. Examples of data relating to particular environmental media and socio-economic and development aspects are included in the appendix.

E 4 PROCESS, QUALITY AND SELF-CHECKING

The entire process of data acquisition and processing must be documented. In addition a system for information procurement and processing and quality control must be established. Furthermore, the monitoring should be capable of self-checking using plausibility checks.

E 4.1.1 Procedures	
Data *Please indicate table and ID number.* ***(EB PDD D.6.)***	Quantity of natural gas consumed by boiler houses and CHP units. Amount of oil (mazut) consumed by boiler houses. Table: E2.1.1.; ID 1, Emission 1.
Data acquisition (including measuring methods)	Data is obtained by recording from gas flow meter indicators at each gas consuming object. Data on oil consumption is also performed by boiler operator by putting callibrated stick to the oil reservoir, and recording the result on paper.
How is the data transmitted?	Monthly values on consumed gas and oil transferred to the central SImferopol office either by phone/fax/e-mail. Monthly values recorded electronically by the Production and Technical Department of LE “Krymteplocomunenergo” in the central office.
Uncertainty level of data (high/medium/low)	Low for gas

(EB PDD D.6.)	Low for oil
Are quality assurance/quality control procedures planned for these data? *Please add an explanation.* ***(EB PDD D.6.)***	☒ Yes: Every year after heating season the calibration of gas flow meters is performed. ☐ No: _____
Measures for quality assurance	Every year gas flow meter is brought to State Standard body for checking and certification. Sticks for oil do not need to be calibrated.
Checking of data for consistency, completeness and correctness	Measures: - comparison with reading of gas flow meter for previous similar period; - ensuring uninterrupted work of gas flow meter during required period of measurement.
How are errors during data acquisition dealt with?	In case of error in data acquisition amount of consumed natural gas can be defined on the basis of meterage of gas flow meter of a gas supplier.

E 4.1.2 Procedures	
Data *Please indicate table and ID number.* ***(EB PDD D.6.)***	Quantity of landfill gas (methane) consumed by boiler house at 66 Glynki str., and quantity of landfill gas flared. Table: E2.1.3.; ID 3, Emission 3.
Data acquisition (including measuring methods)	Data is obtained by recording from gas flow meter indicator every day and gas analyzer indicator every hour. Hourly data transformed into average daily.
How is the data transmitted?	Monthly values on consumed LFG methane and its concentration transferred to the central SImferopol office by phone from 66 Glynki str. boiler house operator. Monthly values recorded electronically by the Production and Technical Department of LE "Krymteplocomunenergo".
Uncertainty level of data (high/medium/low) ***(EB PDD D.6.)***	Low for landfill gas quantity Low for LFG methane content
Are quality assurance/quality control procedures planned for these data? *Please add an explanation.* ***(EB PDD D.6.)***	☒ Yes: Every year after heating season the calibration of gas flow meters and gas analyzer will be performed. ☐ No: _____
Measures for quality assurance	Every year gas flow meter will be calibrated by State Standard body for checking and certification.
Checking of data for consistency,	Measures:

completeness and correctness	- comparison of gas flow meter data at the boiler house with the gas flow meter at the landfill; - ensuring uninterrupted work of gas flow meter during required period of measurement.
How are errors during data acquisition dealt with?	In case of error in data acquisition amount of consumed landfill gas can be defined on the basis of meterage of gas flow meter installed at the landfill.

E 4.1.3 Procedures	
Data *Please indicate table and ID number.* ***(EB PDD D.6.)***	Electric capacity generated by CHP units. Table: E2.3.2.; ID 5, Emission 5.
Data acquisition (including measuring methods)	Data is obtained by recording from electricity meter indicators installed at each CHP unit every day.
How is the data transmitted?	Monthly values on generated electricity transferred to the central Simferopol office by phone from 66 Glynki str. by CHP operator. Monthly values recorded electronically by the Production and Technical Department of LE "Krymteplocomunenergo".
Uncertainty level of data (high/medium/low) ***(EB PDD D.6.)***	Low
Are quality assurance/quality control procedures planned for these data? *Please add an explanation.* ***(EB PDD D.6.)***	☒ Yes: Once a year calibration of electricity meters will be performed. ☐ No: _____
Measures for quality assurance	Every year electricity meter will be calibrated by State Standard body for checking and certification.
Checking of data for consistency, completeness and correctness	Measures: - comparison of electricity meter data at the CHP unit with the electricity meter at boiler house; - ensuring uninterrupted work of electricity meter during required period of measurement.
How are errors during data acquisition dealt with?	In case of error in data acquisition amount of generated electricity the capacity can be defined on the basis of data of electricity consumed by the boiler house, which consumes this electricity.

E 4.1.4 Procedures	
Data	Outside temperature.

Please indicate table and ID number. ***(EB PDD D.6.)***	Table: E2.3.3.; ID 6
Data acquisition (including measuring methods)	Data is obtained by recording thermometer data by boiler house operators.
How is the data transmitted?	Average monthly values of temperature transferred to the central SImferopol office by phone by boiler house operator. Average monthly values recorded electronically by the Production and Technical Department of LE "Krymteplocomunenergo".
Uncertainty level of data (high/medium/low) ***(EB PDD D.6.)***	Low
Are quality assurance/quality control procedures planned for these data? *Please add an explanation.* ***(EB PDD D.6.)***	☐ Yes: _____ ☒ No: Thermometers do not need to be checked for a few years.
Measures for quality assurance	Outside temperature data from two boiler houses located in the same city should be similar.
Checking of data for consistency, completeness and correctness	Measures: - comparison of thermometers data at boiler house with temperature data at nearest boiler house or checking with Hydrometheorological Service data.
How are errors during data acquisition dealt with?	In case of error in data acquisition, outside temperature can be compared with the other nearest boiler house data or with Hydrometheorological Service data.

E 4.1.5 Procedures	
Data *Please indicate table and ID number.* ***(EB PDD D.6.)***	Inside temperature. Table: E2.3.4.; ID 7
Data acquisition (including measuring methods)	Data is obtained by recording thermometer data inside of boiler house.
How is the data transmitted?	Average monthly values of inside temperatures transferred to the central Simferopol office by phone by boiler house operators. Average monthly values recorded electronically by the Production and Technical Department of LE "Krymteplocomunenergo".
Uncertainty level of data (high/medium/low)	Low

(EB PDD D.6.)	
Are quality assurance/quality control procedures planned for these data? *Please add an explanation.* ***(EB PDD D.6.)***	☐ Yes: _____ ☒ No: Thermometers do not need to be checked for a few years.
Measures for quality assurance	Each boiler house operator who uses services of the boiler house he operates will be responsible for accurate data acquisition during heating season.
Checking of data for consistency, completeness and correctness	Measures: - comparison of thermometers data at home of each boiler house operator with temperature data at his colleagues homes.
How are errors during data acquisition dealt with?	Risk of an error is minimal.

E 4.1.6 Procedures	
Data *Please indicate table and ID number.* ***(EB PDD D.6.)***	Fuel quality (Lower Heating Values). Table: E2.3.5.; ID 8
Data acquisition (including measuring methods)	Data is obtained from fuel suppliers.
How is the data transmitted?	Every 10 days gas suppliers provide data on natural gas Lower Heating Value. Which is recorded in relevant documents. Oil usually bought before each heating season, and supplier indicates its LHV. All these values recorded electronically by the Production and Technical Department of LE "Krymteplocomunenergo".
Uncertainty level of data (high/medium/low) ***(EB PDD D.6.)***	Low
Are quality assurance/quality control procedures planned for these data? *Please add an explanation.* ***(EB PDD D.6.)***	☒ Yes: Ordering chemical analysis of fuel at chemical laboratory. ☐ No: _____
Measures for quality assurance	Even though there is no need to mistrust fuel suppliers, the Applicant will periodically check the data provided by fuel suppliers through performing chemical analyzes of supplied fuel. Once every season.
Checking of data for consistency, completeness and correctness	Measures: - comparison of laboratory analysis data with data provided by fuel supplier.

How are errors during data acquisition dealt with?	If data do not match. Another expertise shall be performed.

E 4.1.7 Procedures	
Data *Please indicate table and ID number.* ***(EB PDD D.6.)***	Number of customers (heating area). Table: E2.3.6.; ID 9
Data acquisition (including measuring methods)	Data is available before each heating seasons. Relevant records on what customers are serviced and which have disconnected from DH system is available for office managers at Production and Technological Department of LE "Krymteplocomunenergo"
How is the data transmitted?	The decision on connecting and disconnecting new customers is always at the disposal of Applicant's central Simferopol office.
Uncertainty level of data (high/medium/low) ***(EB PDD D.6.)***	Low
Are quality assurance/quality control procedures planned for these data? *Please add an explanation.* ***(EB PDD D.6.)***	☐ Yes: _____ ☒ No: this data is always correct.
Measures for quality assurance	No quality assurance is needed.
Checking of data for consistency, completeness and correctness	Measures: N/a.
How are errors during data acquisition dealt with?	Wrong data can always be checked at relevant documents.

E 5 RESPONSIBILITIES

E 5.1 Responsibilities	
Technical responsibility	Contact person: Chief Engineer, Mr. Sheiman Michail Address: 3-A Gaidara Str., Simferopol, Autonomous Republic of Crimea, 95000 Phone/fax: +38 (0652) 22 03 01, +38 (0652) 22 12 13

	E-mail: pto@tce.crimea.com
Commercial responsibility	Contact person: General Director, Mr. Vail Igor Valentinovych Address: 3-A Gaidara Str., Simferopol, Autonomous Republic of Crimea, 95000 Phone/fax: +38 (0652) 22 03 01, +38 (0652) 22 12 13 E-mail: tce@tce.crimea.com
Responsibility for data acquisition	Contact person: Head of Production and Technological Department, Mr. Zhukovskiy Sergei Nikolaevich Address: 3-A Gaidara Str., Simferopol, Autonomous Republic of Crimea, 95000 Phone/fax: +38 (0652) 22 02 29 E-mail: pto@tce.crimea.com
Responsibility for calculation of emission reductions	Contact person: Head of Production and Technological Department, Mr. Zhukovskiy Sergei Nikolaevich Address: 3-A Gaidara Str., Simferopol, Autonomous Republic of Crimea, 95000 Phone/fax: +38 (0652) 22 02 29 E-mail: pto@tce.crimea.com
Responsibility for monitoring supervision	Contact person: Consultant for SEC “Biomass” – Mr. Alexander Filonenko Address: 2A, Zhelyabov str., Kyiv, Ukraine, 03057 Phone/fax: +(38 044) 456 94 62; fax: +(38 044) 456 94 62 E-mail: filonenko@biomass.kiev.ua