JOINT IMPLEMENTATION PROJECT

"Energy efficiency improvement at Novoyavorivska TPP by reequipment thereof"

Position of the head of the organization, institution, body, which prepared the document

Director of ORELAC GmBH (Liechtenstein)		**Markus Emil Buechel**
(position)	(signature)	(name and patronymic, last name)

PS

Position of the economic entity – owner of the source, where the Joint Implementation Project is planned to be carried out

Director of Scientific-Production Enterprise "Energiya-Novoyavorivsk" LLC		**Oleksandr Oleksyuk**
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PS

Novoyavorivsk 2012

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

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SECTION A. General description of the project

A.1. Title of the project:

Energy efficiency improvement at Novoyavorivska TPP by re-equipment thereof

Sectoral scope: Sector 1. Energy industry (renewable / non-renewable sources)

PDD Version 01

Date: 20/02/2012

A.2. Description of the project:

The purpose of this project is the reduction of anthropogenic GHG emissions by implementation of combined heat and power at the existing boiler house in Novoiavorivsk city, Lviv region, Ukraine.
The project provides for the commissioning of new P-4-21/3 No.1 steam turbine with T4-2UZ generator, P-6-35/3M No.2 steam turbine with T6-2UZ generator and gas turbine unit (GTU) with DZh59L3 engine and T202UZ generator. The commissioning of these steam turbines and the GTU would allow of generation of heat as by-product of combined power generation. Thus, the project activity will result in substantial GHG emission reductions due to the substitution of electricity from the power system of Ukraine and the use of heat as by-product of combined heat and power.
The project will also bring environmental benefits by reducing emissions of SO_2, NO_X and dust into the air from old thermal power plants.

Situation that existed before the launch of the Project
In 2003, Scientific-Production Enterprise "Energiya-Novoyavorivsk" LLC decided to design and implement the project of combined heat and power generation at the existing boiler house in Novoiavorivsk city, Ukraine's Lviv region.
In 2003, the "Implementation of heat and electricity cogeneration in Novoiavorivsk" investment project was designed. The detailed project design was completed in 2004. The permit for construction and assembly work was obtained in 2006.

Prior to the start of the Project, natural-gas fired steam and water boilers at the existing boiler house in Novoiavorivsk, Lviv region, generated only thermal energy for heat and hot water supply to consumers. The total pre-Project heat capacity was 59.9 Gcal/h.

Baseline scenario
The baseline scenario for the Project is continuation of the practice existing prior to the launch of the Project. Electricity in the amount equivalent to Novoyavorivska TPP generation would have been produced at power plants connected to the Ukrainian power grid, and heat would have been generated by the existing (or new) boilers by means of natural gas combustion.

Project scenario
The Project scenario envisages switching the existing boiler house in Novoiavorivsk to combined heat and power generation through implementation of new power generating units, including: new P-4-21/3 No.1steam turbine, T4-2UZ generator, P-6-35/3M No.2 steam turbine, T6-2UZ generator and gas turbine unit (GTU) with DZh59L3 engine and T202UZ generator. Upon the implementation of the Project,

Novoyavorivska TPP will reach the total electrical capacity of 25 MW and heat capacity of about 59.9 Gcal/h.[1]

The project will also bring experience of implementation of modern cogeneration technologies and reduction of GHG emissions by substitution of electricity from the grid of Ukraine.

Table 1. Historical details of project development

Type of actions	Documentary evidence	Date
Registering of an investment project	Investment project "Electricity and thermal energy cogeneration in Novoiavorivsk"	24/12/2003
Signing of an emission reductions purchase agreement relating to the joint implementation project No.5	Agreement between Biecas Investment Industries Limited and Scientific-Production Enterprise "Energiya-Novoyavorivsk" LLC (Novoyavorivska TPP)	07/07/2011
Signing of a novation agreement	Agreement between Biecas Investment Industries Limited and ORELAC GmBH	13/09/2011
Project design document development for the project "Energy efficiency improvement at Novoyavorivska TPP by re-equipment thereof"	JI PDD "Energy efficiency improvement at Novoyavorivska TPP by re-equipment thereof"	26/12/2003
Preparation and submission of the project idea note to support anthropogenic GHG emissions reductions, to the State Environmental Investment Agency of Ukraine.	Supporting materials for the potential JI project "Energy efficiency improvement at Novoyavorivska TPP by re-equipment thereof"	16/02/2012
Obtaining of a Letter of Endorsement from the State Environmental Investment Agency of Ukraine	Letter of Endorsement No.1096/23/7 for the Joint Implementation project "Energy efficiency improvement at Novoyavorivska TPP by re-equipment thereof" dated 26/04/2012	26/04/2012

A.3. Project participants:

Party involved*	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Ukraine (Host Party)	• Scientific-Production Enterprise "Energiya-Novoyavorivsk" LLC	No

[1] http://www.ukrenergo.energy.gov.ua/ukrenergo/control/uk/publish/article?art_id=63551&cat_id=35061

	(Novoyavorivska TPP)	
Switzerland	• CEP CARBON EMISSIONS PARTNERS S.A.	No
*Please indicate if the Party involved is a Host Party.		

A.4. Technical description of the project:

A.4.1. Location of the project:

The project is located in Lviv region, Ukraine.
Figures 1, 2 present the geographical location of the project.

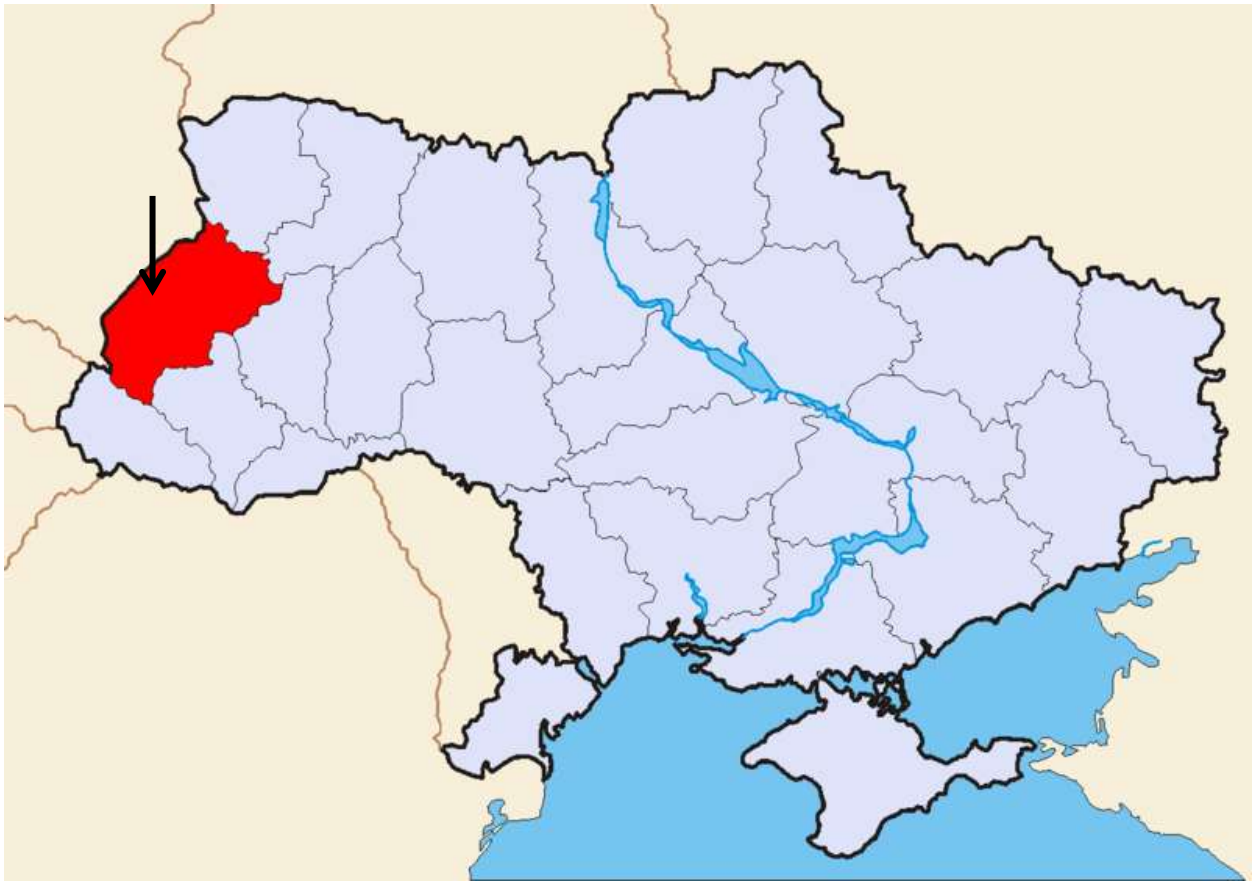

Figure 1. Location of Scientific-Production Enterprise "Energiya-Novoyavorivsk" LLC on the map of Ukraine

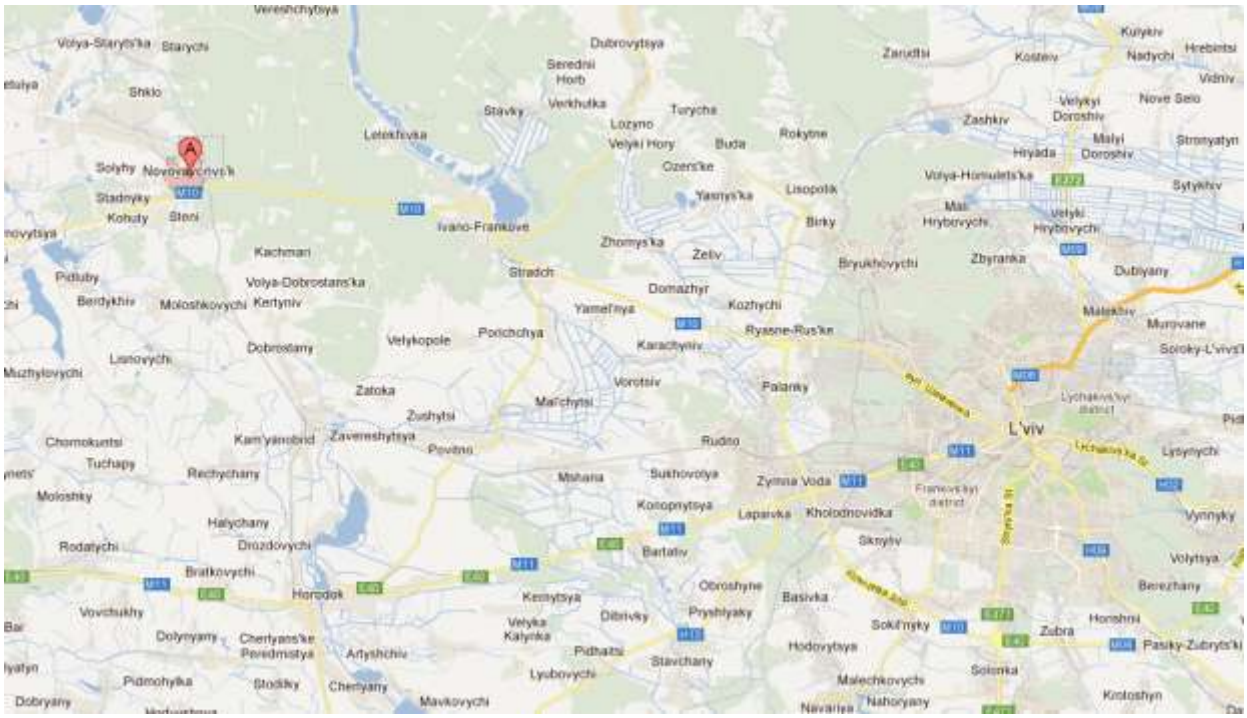

Figure 2. Location of the Project

A.4.1.1. Host Party(ies):

The project is located in the territory of Ukraine.

Ukraine is an Eastern European country that ratified the Kyoto Protocol to the UN Framework Convention for Climate Change on Febuary 4, 2004[2]. It is listed in the Annex 1 and meets the requirements of participation in Joint Implementation projects[3].

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

Lviv region

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

Novoiavorivsk city

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

Novoiavorivsk is a city of district subordinance in Yavorivskyi district of Lviv region, located 20 km away from Yavoriv and 30 km away from the regional centre, Lviv, 300 m above sea level at the boundary of Roztochchia and Sian Lowland in Shklo River headwaters.

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

Coordinates: 49° 55′ 52″ N, 23° 34′ 23″ E.

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

Before the launch of the project, steam boilers and water boilers were installed at the existing boiler house in Novoiavorivsk to suppy thermal energy, heating and hot water to Novoiavorivsk consumers.
The figure below illustrates the technological scheme of the existing boiler house in Novoiavorivsk before the Project started.

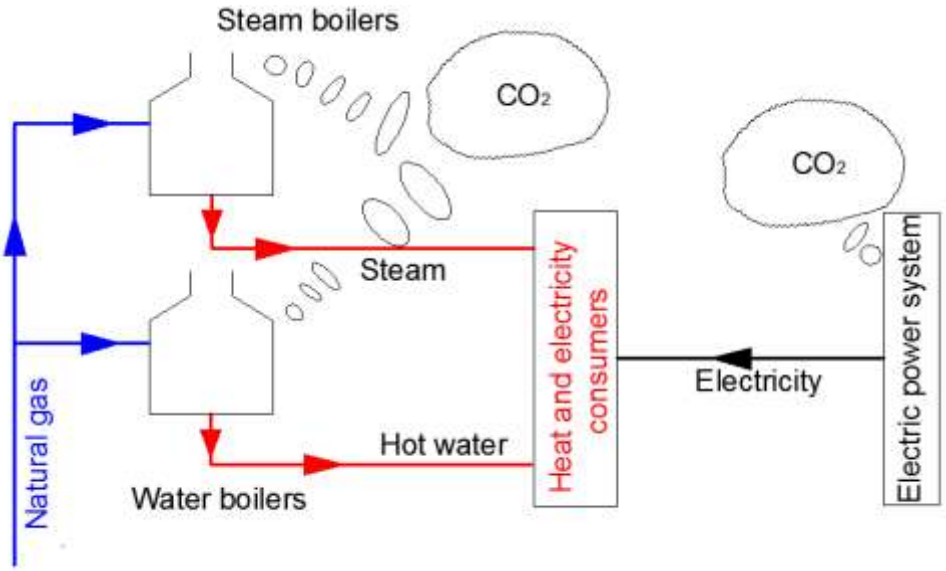

Figure 3. Technological scheme of equipment before the launch of the Project

Boiler house equipment is in satisfactory condition and can operate in its normal mode. The activities planned will improve the efficiency of boiler house operation.
The Project provides for the implementation of new P-4-21/3 No.1 cogeneration turbine with T4-2UZ generator, new P-6-35/3M No.2 cogeneration turbine with T6-2UZ generator and DZh59L3 gas turbine unit (GTU) and T202UZ generator for combined power and heat generation.
Steam from boilers will be fed to P-4-21/3 and P-6-35/3M steam turbine units. After the turbines, steam will have sufficient parameters (temperature around 200℃) to feed heat exchange equipment (system water heaters No.1, 2, 3) for heat generation. The steam turbines have the total capacity of 10 MW and, despite their efficiency factor of a mere 25%, high efficiency can be reached upon operation thereof within the waste-heat loop.
The advanced operation of GTU with steam boilers will ensure reliable power supply to meet on-site needs of the plant, which, in turn, will improve heat supply of consumers and reduce specific fuel consumption per unit of heat or electricity generated.
The gas turbine module will be integrated into the thermal scheme of the boiler house. In fact, this is boiler house capacity expansion as it results in higher thermal capacity. Part of flue gases at the GTU output will be fed to system water gas heaters (SWGH) and then to boiler burners; the other part of flue gases will be discharged through boiler house chimney.
WHB No.1 and WHB No.2 are E-45-2.4/380 waste-heat boilers, capable of operating in recovery mode, combined mode and autonomous mode.
Recovery mode means recovery of flue gases after the GTU.
Combined mode means recovery of flue gases after the GTU and combustion of natural gas on 2 or 4 burners.

Autonomous mode means natural gas fired operation on 2 or 4 burners. Specifications of steam turbines are provided in tables below.

This project uses the technology that goes in line with the modern global practice. The technology of switching the boiler house to the TPP mode is a highly promising energy saving technology enabling effective use of resources consumed. The servicing staff will be specially trained to operate the new equipment. The project activity is unlikely to be substituted with any other activity because the proposed heat and electricity generation technology meets all the modern requirements for this type of activity.

Specifications of steam turbines are provided on the manufacturer's web-site.[4]

Table 2. Specifications of steam turbines and generators

No.	Type	Steam parameters		Power	Efficiency factor
		P_1, atm	t_1, C°	electrical, MW	
1	Steam turbine P-4-21/3 No.1, generator T4-2UZ	21	370	4	~25%
2	Steam turbine P-6-35/3M No.2, generator T6-2UZ	35	435	6 (3.2)	~25%

Specifications of the GTU are provided on the manufacturer's web-site.[5]

Table 3. Specifications of the GTU

No.	Type	Fuel		Power	Efficiency factor
		Type	Nominal pressure, (kgf/cm^2)	electrical, MW	
1	Gas turbine engine DZH59LZ	Natural gas	25	15	29.5%

The figure below illustrates the arrangement of the equipment installed upon implementation of the Project.

[4] http://oaoktz.ru/

[5] http://www.zorya.com.ua/

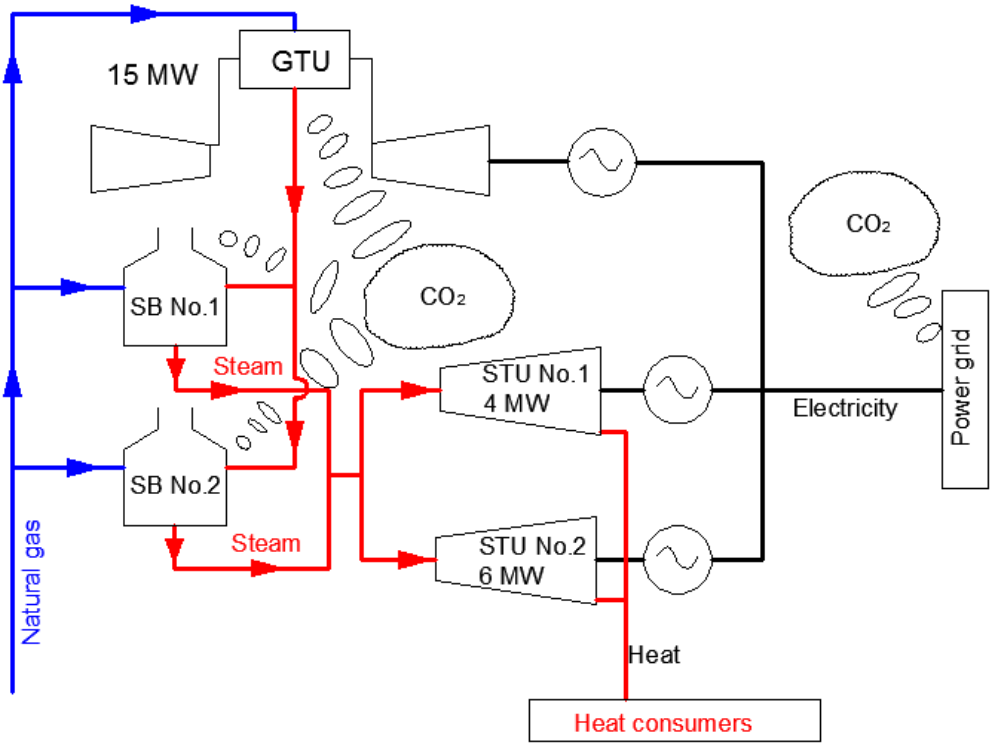

Figure 4. Technological scheme of combined heat and electricity generation

The cycle arrangement of the TPP after the project implementation is provided below.

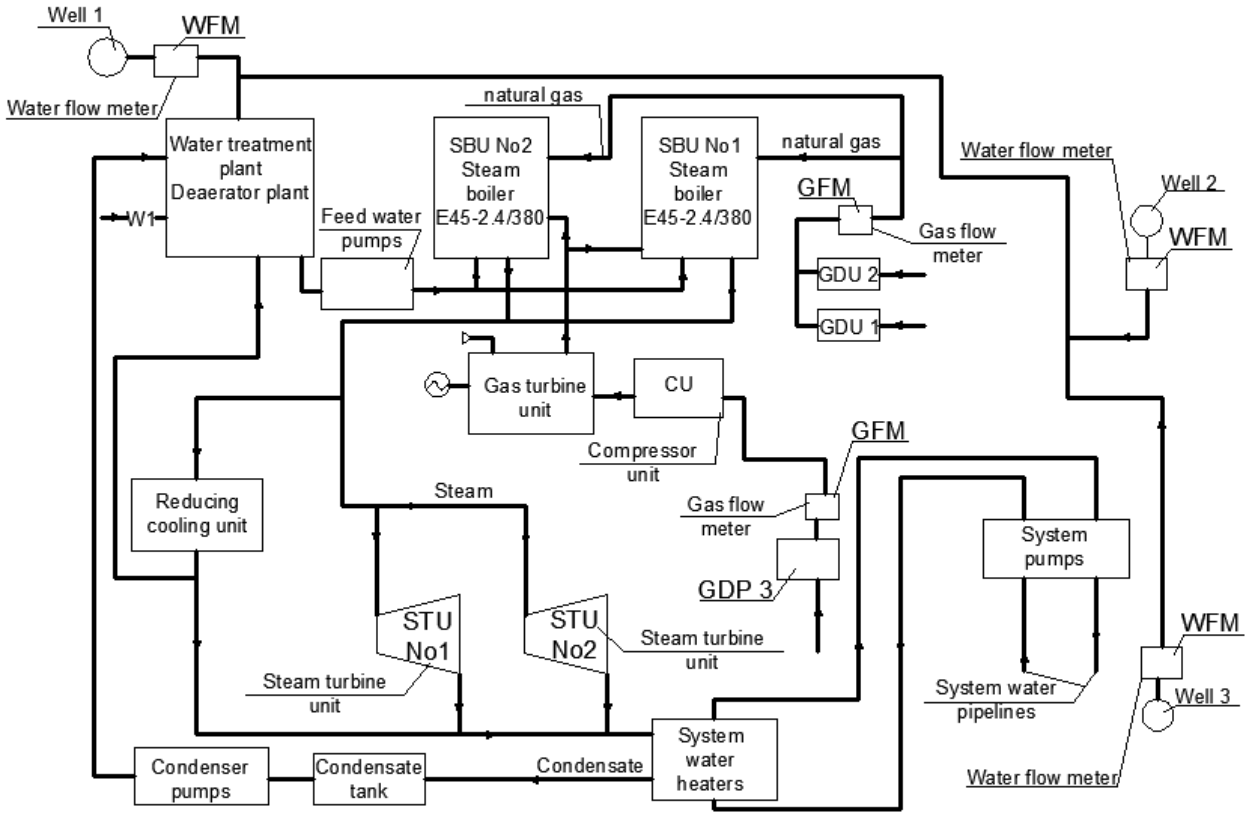

Figure 5. Cycle arrangement of the TPP

Thus, the Project will reduce GHG emissions by substitution of electricity from the Ukrainian power grid, which, in turn, will cause a decrease in fossil fuel (mainly coal) consumption by thermal power plants of Ukraine, and heat, which will be recovered with higher efficiency due to installation of modern thermal steam turbines and a gas turbine unit which will be integrated into the heat scheme of the boiler house.
The implementation plan of "Energy efficiency improvement at Novoyavorivska TPP by re-equipment thereof" Project is provided in Table 4.

Table 4. Project implementation plan

No.	*Project milestones*	*Period*
1	Investment project development	2003
2	Development of detailed design	2003-2004
3	Commissioning of P-4-21/3 No.1 steam turbine, T4-2UZ generator.	2006
4	Commissioning of a gas turbine unit with DZH59LZ engine and T202UZ No.3 generator	2008

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

Implementation of combined heat and power technology under the proposed JI project will improve energy efficiency at Novoyavorivska TPP. The TPP reconstruction will cause a major reduction of natural gas consumption in the course of heat and electricity generation, as well as a lower on-site consumption of electricity, which will lead to lower GHG emissions into the atmosphere. In the absence of the Project, some 100 000 MWh/year of electricity would be generated by power plants using fossil fuel connected to the Ukrainian power grid, which would cause yearly increases in GHG emissions and worsening environmental situation in the region.
According to research results, Ukraine has been pursuing energy efficiency development in energy sector through various laws since 1994:

- On energy saving (Law of Ukraine No. 74/94-VR of 01/07/1994)
- On heat supply (Law of Ukraine No. 3260-IV of 22/12/2005)
- On changes to the Laws of Ukraine "On energy saving" and "On heat supply", Law of Ukraine No. 2633-IV of 02/06/2005)

These laws do not require energy industry companies to implement such projects or any reconstructions aimed at energy efficiency. Moreover, these laws envisage no financial incentives for energy efficiency improvement. Despite the existing legislation, Ukraine is still among world's leading energy consumers, having the highest emission rate per GIP unit among CIS member states[6].
In March 2006, the Government of Ukraine approved the "Energy strategy of Ukraine till 2030"[7]. The strategy provides for higher electricity consumption along with economy development in the following years. Improvement of energy consumption and generation efficiency is one of stumbling blocks for the strategy. The proposed JI project is in line with the priorities of the state energy strategy because it will increase the rates of heat and electricity generation as well as improve the specific efficiency of heat and electricity generation at Novoyavorivsk TPP.

[6] http://www.undp.org.ua/

[7] http://search.ligazakon.ua/l_doc2.nsf/link1/FIN38530.html

The "Energy strategy of Ukraine till 2030"[8] does not require the owners of Novoyavorivska TPP to implement the project. The implementation of this Project requires large investment which the company is unable to attract by itself. Long-term project financing in Ukraine is limited, and banks grant loans for short term at high interest rates.
Taking into account the above-mentioned, it is obvious that the Project would not be implemented without the JI mechanism and no reduction of GHG emissions would take place.

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

Table 5. Estimated amount of emission reductions for the period prior to the first commitment period

	Years
Length of the crediting period	1
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2007	2 060
Total estimated emission reductions prior to the crediting period (tonnes of CO_2 equivalent)	**2 060**
Annual average of estimated emission reductions prior to the crediting period (tonnes of CO_2 equivalent)	**2 060**

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

	Years
Length of the crediting period	5
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2008	34 974
2009	51 665
2010	55 849
2011	43 927
2012	43 927
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**230 342**
Annual average of estimated emission reduction over the crediting period (tonnes of CO_2 equivalent)	**46 068**

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

	Years
Length of the crediting period	16
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2013	43 927

[8] http://search.ligazakon.ua/l_doc2.nsf/link1/FIN38530.html

2014	43 927
2015	43 927
2016	43 927
2017	43 927
2018	43 927
2019	43 927
2020	43 927
2021	43 927
2022	43 927
2023	43 927
2024	43 927
2025	43 927
2026	43 927
2027	43 927
2028	43 927
Total estimated emission reductions after the crediting period (tonnes of CO_2 equivalent)	**702 832**
Annual average of estimated emission reduction after the crediting period (tonnes of CO_2 equivalent)	**43 927**

A.5. Project approval by the Parties involved:

Letter of Endorsement No. 1096/23/7 dated 26/04/2012 for the JI project "Energy efficiency improvement at Novoyavorivska TPP by re-equipment thereof" was issued by the State Environmental Investment Agency of Ukraine.
Upon the completion of project determination, the PDD and the Determination Report will be submitted to the State Environmental Investment Agency of Ukraine in order to obtain a Letter of Approval.

SECTION B. Baseline

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

According to Article 20 of the "Guidance on criteria for baseline setting and monitoring" Version 03[9] approved by JISC[10], project participants may select either:

(a) An approach for baseline setting and monitoring developed in accordance with Appendix B of the JI guidelines (JI-specific approach); or

(b) A methodology for baseline setting and monitoring approved by the Executive Board of the clean development mechanism (CDM); or

(c) An approach for baseline setting and monitoring already taken in comparable JI cases.

The proposed project applies the approach for baseline setting and monitoring specific for this JI project.

The JI project baseline is described and justified using a step-by-step approach:

Step 1. Identification and description of the selected approach for the baseline setting

Appendix B to the Guidelines for the Implementation of Article 6 of the Kyoto Protocol[11] says the baseline scenario "is the scenario that reasonably represents the anthropogenic emissions by sources or anthropogenic removals by sinks of greenhouse gases that would occur in the absence of the proposed project."

The proposed project applies the JI-specific approach based on the "Guidance on criteria for baseline setting and monitoring" Version 03[12] using the elements of the Joint Implementation Supervisory Committee (JISC[13]) approved methodology AM0099 "Installation of a new natural gas fired gas turbine to an existing CHP plant" Version 01.0.0 [14]. The Project does not meet all the requirements of AM0099 methodology, but the fundamentals of the Project, namely "combined heat and power", are fully consistent with the methodology. The choice AM0099 methodology is also based on its innovativeness for projects of this type. It was approved during the CDM Executive Board meeting No.65 and came into force on November 25, 2011.

The Project complies with the following AM0099 [15] requirements:

• The project activity provides for installation of a new natural-gas fired gas turbine to supply electricity to the national power grid of Ukraine. Heat from the new gas turbine will be recovered and used for thermal power generation.

• The existing TPP generated thermal power for at least three years prior to the implementation of the Project activity.

• Natural gas is sufficiently available in Ukraine. TPPs fired with natural gas are common practice in the country.

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[9] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf
[10] http://ji.unfccc.int/Sup_Committee/index.html

[11] http://unfccc.int/files/meetings/cop_11/application/pdf/cmp1_25_5_implementation_of_art_6_kp.pdf

[12] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf
[13] http://ji.unfccc.int/Sup_Committee/index.html

[14] https://cdm.unfccc.int/filestorage/0/B/E/0BEUQZTAK25VWONI39L4D1HC8S6MPF/F-CDM-AM%20-%20PDF%20version.pdf?t=YlV8bTg0cWg4fDCnfVrzgbkJRMIqwpxJNrgx

[15] https://cdm.unfccc.int/filestorage/0/B/E/0BEUQZTAK25VWONI39L4D1HC8S6MPF/F-CDM-AM%20-%20PDF%20version.pdf?t=YlV8bTg0cWg4fDCnfVrzgbkJRMIqwpxJNrgx

• The baseline scenario combines options [E2][16] (Electricity generation by the grid connected power plants) and [H2][17] (Steam is generated at the existing CHP plant).
Moreover, the following CDM Executive Board approved documents were used to estimate baseline emissions:
"Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" Version 02[18]:
"Tool to determine the baseline efficiency of the thermal or electric energy generation systems" Version 01[19]

Step 2. Application of approach chosen

The choice of a plausible baseline scenario is based on estimation of alternatives, which could potentially take place as of early 2003.
These alternatives are the following:
Alternative 1.1: The continuation of the existing practice, without JI project implementation.
Alternative 1.2: The proposed project activity not undertaken as a JI project activity.
Alternative 1.3: The partial implementation of the Project (only some of project activities implemented) without the use of the JI mechanism.

All the above *Alternatives* meet the requirements of the Ukrainian legislation.

Alternative 1.1
The continuation of the existing practice of Novoyavirivska TPP operation, which includes many technological processes aimed at heat generation.
This practice would keep thermal power capacity of Novoyavorivska TPP at the stable level without equipment replacement with further use of electricity from the national power grid.
This *Alternative* is the most plausible baseline scenario because it:
- provides for sufficient heat generation;
- does not require investments into new technological equipment.

Thus, *Alternative 1.1* can be deemed the most plausible baseline.

Alternative 1.2
The proposed project activity not undertaken as a JI project activity.
The project technology of equipment replacement at Novoyavorivska TPP provides for commissioning of two steam turbines P-4-21/3 No.1 (with T4-2UZ generator) and P-6-35/3M No.2 (with T6-2UZ generator), as well as a gas turbine unit with DZh59LZ engine and T202UZ No.3 generator. This equipment replacement will allow the CHP plant to produce about 125 500 MW per year of electricity and sufficient amount of heat.
This *Alternative* is the least plausible baseline scenario because:
- it requires substantial investments into new technological equipment with a long payback period;
- it requires compliance with higher requirements towards equipment operation;

[16] https://cdm.unfccc.int/filestorage/0/B/E/0BEUQZTAK25VWONI39L4D1HC8S6MPF/F-CDM-AM%20-%20PDF%20version.pdf?t=YlV8bTg0cWg4fDCnfVrzgbkJRMIqwpxJNrgx

[17] https://cdm.unfccc.int/filestorage/0/B/E/0BEUQZTAK25VWONI39L4D1HC8S6MPF/F-CDM-AM%20-%20PDF%20version.pdf?t=YlV8bTg0cWg4fDCnfVrzgbkJRMIqwpxJNrgx

[18] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf

[19] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-09-v1.pdf

- there are major financial risks for the company because the CHP plant would reach targeted capacity gradually rather than immediately.

Thus, *Alternative 1.2* cannot be considered a plausible baseline.

Alternative 1.3

The partial implementation of the Project (only some of project activities implemented) without the use of the JI mechanism.

This alternative provides for exclusion from the project boundary of any secondary project activities, such as installation of a gas turbine unit, a steam turbine, etc. The proposed innovative technology is a complex process that requires only comprehensive approach, so the partial implementation will not result in major improvement of energy efficiency and electricity generation. *Alternative 1.3* requires investments into new technological equipment and encounters a lack of qualified servicing personnel; therefore *Alternative 1.3* cannot be considered a plausible baseline.

The analysis of the alternatives provided above shows that *Alternative 1.1* is the most plausible one.

The results of the investment analysis presented in Section B.2 show that *Alternatives 1.2* and *1.3* cannot be considered the most plausible ones from the financial standpoint. The analysis undertaken in Section B.2 in accordance with the "Tool for the demonstration and assessment of additionality" Version 06.0.0[20] demonstrates the additionalty of the Project.

Description of the baseline scenario

This project design document (PDD) uses elements of the CDM approved methodology AM0099 "Installation of a new natural gas fired gas turbine to an existing CHP plant" Version 01.0.0[21], adjusted so that it could be better applied in the circumstances of the Project. This approach also takes into account the baseline setting criteria provided in Appendix B to the Guidelines for the Implementation of Article 6 of the Kyoto Protocol[22] and meets the JISC[23] recommendations.

It has been identified that the only viable and realistic alternative to this Project is the continuation of the existing practice of Novoyavorivska TPP operation, providing for heat generation only, with electricity generated by power plants connected to the national power grid.

Pursuant to the requirements of the "Guidance on criteria for baseline setting and monitoring" Version 03[24], the baseline was identified on the basis of conservative assumptions and that the baseline scenario [H2][25] uses the efficiency factor of 92% for boilers as stated in Table 1 of the"Tool to determine the baseline efficiency of thermal or electric energy generation systems" Version 01[26] (New natural-gas fired boiler).

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[20] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf

[21] https://cdm.unfccc.int/filestorage/0/B/E/0BEUQZTAK25VWONI39L4D1HC8S6MPF/F-CDM-AM%20-%20PDF%20version.pdf?t=YlV8bTg0cWg4fDCnfVrzgbkJRMIqwpxJNrgx

[22] http://unfccc.int/files/meetings/cop_11/application/pdf/cmp1_25_5_implementation_of_art_6_kp.pdf

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

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

[25] https://cdm.unfccc.int/filestorage/0/B/E/0BEUQZTAK25VWONI39L4D1HC8S6MPF/F-CDM-AM%20-%20PDF%20version.pdf?t=YlV8bTg0cWg4fDCnfVrzgbkJRMIqwpxJNrgx

[26] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-09-v1.pdf

GHG emissions under the Baseline scenario (BE_y):

Baseline emissions during period y are calculated by the following formula (BE_y):

$$BE_y = BE_{Elec,y} + BE_{Ther,y} \quad [B1]$$

where:

BE_y - Total baseline emissions in period y, t CO_2e;
$BE_{Elec,y}$ - Baseline emissions due to electricity generation into the Ukrainian grid in period *y*, t CO_2e;
$BE_{Ther,y}$ - Baseline emissions due to heat generation in period *y*, t CO_2e;
[Elec] - index for electricity generation system;
[Ther] - index for heat generation system;
$[y]$ - index for monitoring period.

Baseline emissions during period y due to electricity production in the Ukrainian grid ($BE_{Elec,y}$):

$$BE_{Elec,y} = EG_{Elec,b,y} \times EF_{Elec,y} \quad [B2]$$

where:

$BE_{Elec,y}$ - Baseline emissions due to electricity generation into the Ukrainian grid in period *y*, t CO_2e;
$EG_{Elec,b,y}$ - Electricity supplied to consumers, which would be consumed from the grid in period *y* in the absence of the JI project, MWh;
$EF_{Elec,y}$ - Carbon dioxide emission factor for electricity generation by thermal power plants connected Jkrainian grid in period *y*, t CO_2/MWh;
[Elec] - index for electricity generation system;
[b] - index for baseline emissions;
$[y]$ - index for monitoring period.

Baseline emissions in the course of heat generation by a boiler house in the ansence of the project activity ($BE_{Ther,y}$):

$$BE_{Ther,y} = HG_{Pr,b,y} \times EF_{Heat,y} \quad [B3]$$

where:

$BE_{Ther,y}$ - Baseline emissions due to heat generation in period y, t CO_2;
$HG_{Pr,b,y}$ - Net heat supplied to consumers in the project scenario in period y, TJ;
$EF_{Heat,y}$ - CO_2 emission factor for natural-gas fired boilers which would generate heat for consumers in the absence of the project in period y, t CO_2/TJ;
[Heat] - index for gas boiler heat generation system;
[*Ther*] - index for thermal energy generation system;
[*Pr*] - index for system of heat supply to consumers;
[b] - index for baseline emissions;
[*y*] - index for monitoring period.

Calculation of CO_2 emission factor for heat generation in the baseline scenario ($EF_{heat,y}$):

$$EF_{Heat,y} = \frac{EF_{CO2,NG,y}}{\eta_{NG,Boiler}} \times 100 \quad [B4]$$

where:

$EF_{Heat,y}$ - CO_2 emission factor for natural-gas fired boilers which would generate heat for consumers in

the absence of the project in period *y*, t CO_2/TJ;

$EF_{CO2,NG,y}$ - default carbon dioxide emission factor for stationary combustion of natural gas, in the baseline scenario, t CO_2 /TJ;

$\eta_{NG,Boiler}$ - Efficiency of natural-gas fired boilers, which would generate heat for consumers in the absence of the baseline, %

[Heat] – index for heat generation system;
[NG] – index for natural gas combustion system;
[Boiler] – index for system of natural-gas fired boilers;
[y] – index for monitoring period.

Calculation of default carbon dioxide emission factor for stationary combustion of natural gas in the baseline scenario ($EF_{CO2,NG,y}$):

$$EF_{CO_2,NG,y} = EF_{C,NG,y} \cdot OXID_{NG,y} \cdot 44/12 \qquad [B5]$$

Where:
$EF_{CO2,NG,y}$ – default carbon dioxide emission factor for stationary combustion of natural gas, in the baseline scenario, t CO_2 /TJ;
$EF_{C,NG,y}$ - carbon emission factor in the course of natural gas combustion in period y, t C/TJ;
$OXID_{NG,y}$ - carbon oxidation factor in the course of natural gas combustion in period y, relative units;
$44/12$ - stoichiometric ratio between the molecular weight of carbon dioxide and carbon, t CO_2 /t C;
[NG] – index for natural gas combustion system;
[y] – index for monitoring period.

The tables below provide the list of parameters and other key information used in baseline setting.

Data/Parameter	$EG_{Elec,b,y}$
Data unit	MWh
Description	Electricity supplied to consumers, which would be consumed from the grid in period *y* in the absence of the project
Time of determination/monitoring	Annually
Source of data (to be) used	Information provided by the Project participant SPE "Energiya-Novoyavorivsk" LLC (Novoyavorivska TPP)
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	6-NERC form report
QA/QC procedures (to be) applied	Electricity meters are subject to calibration in accordance with manufacturer's requirements and state standards of Ukraine.
Any comment	Information is archived in paper and electronic form.

Data/Parameter	$HG_{Pr,b,y}$

Data unit	TJ
Description	Net heat generation to be supplied under the project activity in period *y*
Time of determination/monitoring	Annually
Source of data (to be) used	Information provided by the Project participant SPE "Energiya-Novoyavorivsk" LLC (Novoyavorivska TPP)
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	1-S form report
QA/QC procedures (to be) applied	Heat meters are subject to calibration in accordance with manufacturer's requirements and state standards of Ukraine.
Any comment	Information is archived in paper and electronic form.

Data/Parameter	$EF_{C,NG,y}$
Data unit	t C/TJ
Description	Carbon emission factor in the course of natural gas combustion in period *y*
Time of determination/monitoring	Annually
Source of data (to be) used	The "National inventory report of anthropogenic greenhouse gas emissions by sources and removals by sinks in Ukraine for 1990-2010"[27]
Value of data applied (for ex ante calculations/determinations)	2007: Natural gas, t C/TJ: 15.16; 2008: 15.17; 2009: 15.20; 2010: 15.17; 2011: 15.17
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to "Guidance on criteria for baseline setting and monitoring" [28]
QA/QC procedures (to be) applied	Officially approved national data that are actual at the moment of monitoring report preparation will be used.
Any comment	Information will be archived in paper and electronic form.

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

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

Data/Parameter	$OXID_{NG,y}$
Data unit	Relative units
Description	Carbon oxidation factor in the course of natural gas combustion in perid y
Time of determination/monitoring	Annually
Source of data (to be) used	The "National inventory report of anthropogenic greenhouse gas emissions by sources and removals by sinks in Ukraine for 1990-2010"[29]
Value of data applied (for ex ante calculations/determinations)	2007: Natural gas, relative units: 0.995; 2008: 0.995; 2009: 0.995; 2010: 0.995; 2011: 0.995
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Carbon oxidation factor in the course of natural gas combustion is used to determine the default carbon dioxide emission factor for stationary combustion of fossil fuels in Ukraine. The data source for this parameter is the National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine, based on approved national data.
QA/QC procedures (to be) applied	Officially approved national data that are actual at the moment of the monitoring report preparation will be used.
Any comment	Information will be archived in paper and electronic form.

Data/Parameter	$EF_{Elec,y}$
Data unit	t CO_2/MWh
Description	Carbon dioxide emission factor for electricity generation by thermal power plants connected to the national power grid of Ukraine in period *y*
Time of determination/monitoring	Annually
Source of data (to be) used	For 2007 – according to Table 8 ("Emission factors for the Ukrainian grid 2006-2012") of Annex 2 ("Standardized emission factors for the Ukrainian electricity grid") to "Ukraine - Assessment of new calculation of CEF", verified by TUV SUD Industrie Service GmbH, 17.08.2007;[30] Carbon dioxide emission factor for electricity consumption in 2008 are taken from the Decree No.62 of the National Environmental Investment Agency of Ukraine (NEIAU) dated 15.04.2011 "On approval of carbon dioxide emission factor in 2008";[31]

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

30 http://ji.unfccc.int/UserManagement/FileStorage/46JW2KL36KM0GEMI0PHDTQF6DVI514

31 http://www.neia.gov.ua/nature/doccatalog/document?id=127171

	Carbon dioxide emission factor for electricity consumption in 2009 are taken from the Decree No.63 of NEIAU dated 15.04.2011 "On approval of carbon dioxide emission factor in 2009";[32] Carbon dioxide emission factor for electricity consumption in 2010 are taken from the Decree No.43 of NEIAU dated 28.03.2011 "On approval of carbon dioxide emission factor in 2010";[33] Carbon dioxide emission factor for electricity consumption in 2011 are taken from the Decree No.75 of NEIAU dated 12.05.2011 "On approval of carbon dioxide emission factor in 2011".[34]
Value of data applied (for ex ante calculations/determinations)	*Year* | *2007* | *2008* | *2009* | *2010* | *2011* $EF_{Elec,y}$ | 0.807 | 1.055 | 1.068 | 1.067 | 1.063
Justification of the choice of data or description of measurement methods and procedures (to be) applied	If other carbon dioxide emission factors associated with electricity consumption are approved for Ukrainian grids, the baseline will be recalculated for any reporting year according to the Monitoring Plan
QA/QC procedures (to be) applied	N/A
Any comment	Information is archived in paper and electronic form.

Data/Parameter	$\eta_{NG,Boiler}$
Data unit	%
Description	Efficiency of natural gas fired boilers, which would supply heat to consumers in the absence of the project activity
Time of determination/monitoring	Fixed value. Defined during determination.
Source of data (to be) used	"Tool to determine the baseline efficiency of thermal or electric energy generation systems" Version 01[35]
Value of data applied (for ex ante calculations/determinations)	92
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Default value
QA/QC procedures (to be) applied	According to the "Tool to determine the baseline efficiency of thermal or electric energy generation systems" Version 1[36]
Any comment	Information will be archived in paper and electronic form.

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

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

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

[35] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-09-v1.pdf

[36] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-09-v1.pdf

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

Antropogenic greenhouse gas emissions in the project scenario will decrease due to the substitution of electricity from the Ukrainian grid and the use of thermal energy as by-product in combined heat and power generation.

Additionality of the project

The additionality of the project activity is demonstrated and assessed below using the "Tool for the demonstration and assessment of additionality" Version 06.0.0[37]. This manual was originally developed for CDM projects although it is applicable to JI projects as well.

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

Sub-step 1a. Define alternatives to the project activity
There are three alternatives to this project (which have already been discussed in Section B.1).
Alternative 1.1: The continuation of the existing practice, without JI project implementation.
Alternative 1.2: The proposed project activity not undertaken as JI project activity.
Alternative 1.3: The partial implementation of the Project (only some of project activities implemented) without the use of the JI mechanism.

Outcome of Sub-step 1a. Three realistic alternative scenarios to the project activity were identified.

Sub-step 1b. Consistency with mandatory laws and regulations
Alternative 1.1: The continuation of the existing practice, without JI project implementation, is the most plausible baseline scenario because it:
- provides for sufficient heat generation;
- does not require investments into new technological equipment.

The existing legislative documents do not bind the company to commission new equipment. According to Article 5 of the Law of Ukraine "On electric energy"[38], the state policy in the field of electric energy is based on the following principles:
- state regulation of electric energy activities;
- creation of safe operational conditions for electric power facilities;
- ensuring rational fuel and energy consumption;
- compliance with unified state standards and rules by all energy generation, transfer, supply and consumption agents;
- creation of prerequisits for development and upgrade of electric power industry;
- improvement of environmental safety of electric power facilities;
- protection of rights and interests of electricity consumers;
- maintenance of integrity and ensuring the reliable and effective operation of the Ukrainian power grid, unified dispatcher (operational process) control of it;
- encouragement of competition in the electric power market;

[37] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf

[38] http://zakon2.rada.gov.ua/laws/show/575/97-вр

- ensuring the high-quality training of power industry personnel;
- creation of conditions for up-and-coming research;
- ensuring the stable financial standing of electric power industry;
- ensuring the responsibility of electricity suppliers and consumers.

In accordance with Article 10 of the Law "On electric energy", thermal power tariffs are regulated by local executive authorities and local government.
Article 12 of the Law "On electric energy" states the right of the National Commission, which carries out state regulation in energy industry, to ensure pursuance of pricing and tariff policy in the field.
Article 15 of the Law "On electric energy" states that "the prices for electricity of generating companies and wholesale prices are determined under the Rules of the electricity wholesale market of Ukraine".

The existing system of electrical tariff formation in Ukraine does not include the investment component for the development of electric energy. According to the Law "On electric energy", SPE "Energiya-Novoyavorivsk" LLC is neither obliged nor encouraged to commission new steam turbines and gas turbine units (GTUs) at its own expense.
Alternative 1.2: So far SPE "Energiya-Novoyavorivsk" LLC has not taken any significant measures for installation of new equipment. Moreover, SPE "Energiya-Novoyavorivsk" LLC does not have any incentives or funds for implementation of the measures provided by the Project in the absence of its support by the mechanisms established in article 6 of the Kyoto Protocol to the UN Framework Convention On Climate Change (step 1.2, step 2 and step 3 below). SPE "Energiya-Novoyavorivsk" LLC does not have any financial incentives to cover the cost of project implementation or similar measures to the ones represented in this project, except for possible proceeds under the mechanism established by article 6 of the Kyoto Protocol to the UNFCCC.
Alternative 1.3. Implementation of a part of the project activities without funding under the mechanism established by article 6 of the Kyoto Protocol to the UNFCCC (step 1.2, step 2 and step 3 below), like *Alternative 1.2,* is impossible due to the lack of financial incentives.
The commissioning of steam turbines and GTUs without the use of JI mechanism and partial project activity without the use of JI mechanism are consistent with the Ukrainian legislation. More details on legal consistency are provided for *Alternative 1.1*, which is similar in terms of consistency with mandatory laws and regulations to *Alternatives 1.2*. and *1.3.*
Outcome of Sub-step 1b. Under such circumstances one may say that all scenarios are consistent with current laws and regulatory acts.

Therefore **Step 1** is satisfied.
According to the document the "Tool for the demonstration and assessment of additionality" Version 06.0.0,[39] further justification of additionality shall be performed by means of investment analysis.

Step 2. Investment Analysis.
The main purpose of investment analysis is to determine whether the proposed project:
(a) is not the most economically or financially attractive, or
(b) is not economically or financial feasible without income from sale of emission reduction units (ERUs) related to the JI project.

Sub-step 2a. Determination of appropriate analysis method.
There are three methods used for investment analysis: a simple cost analysis (Option I); a comparative investment analysis (Option II); a benchmark analysis (Option III). If the project activities and alternatives identified in Step 1 do not receive other financial or economic benefits other than income

[39] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf

related to JI, then the simple cost analysis (Option I) is applied. Otherwise, the comparative investment analysis (Option II) or the benchmark analysis (Option III) are used.
Guidelines for additionality allow for the performance of comparative investment analysis, which compares corresponding financial indices for the most realistic and reasonable investment alternatives (Option II), or the benchmark analysis (Option III). For this project it is appropriate to apply Option III analysis, according to the instructions of the Guidelines for additionality.

Sub-step 2b. Benchmark analysis.
The proposed project "Energy efficiency improvement at Novoyavorivska TPP by re-equipment thereof" demonstrates additionality using the approach proposed by p.12 of by the "Guidelines on the assessment of investment analysis ver.05"[40], providing for the use of a discount rate that is determined by considering the weighted average cost of capital (WACC). WACC is calculated as a weighted average cost of own and debt capital. The structure of capital is taken in the form of 50/50 own to debt capital. In accordance with paragraph 18 of the "Guidelines on the assessment of investment analysis ver.05"[41] own capital cost is calculated as the sum of risk-free rate (3%), the risk premium on investment in own capital (6.5%) and country risk (6.75%)[42], according to the "Default values for the expected return on equity"[43]. Thus, own capital cost is 16.25%. The cost of debt capital is estimated at the average cost of credit in foreign currency as of the beginning of 2004 according to the NBU, which was 11.80%[44]. Nominal discount rate (WACC) is 14% respectively. Forecasted cash flow is adjusted by inflation rate for euro (2.3%)[45] because the calculation is made in terms of euro.
If the proposed project (not implemented as a JI project) has a less favourable rate, i.e. lower internal rate of return (IRR), than the total limit level, the project may not be considered financially attractive.

Sub-step 2c. Calculation and comparison of financial indicators.
Financial analysis refers to the time of making investment decisions. The following assumptions were used based on information provided by the company.
The project requires investment of approximately 4.2 million euros (according to the NBU rate)[46]
1. The project duration is 25 years (minimal term of the equipment operation);
2. The residual value is calculated as the result of multiplication of unused resource for initial expenses.

Analysis of cash flow takes into account the cash outflow connected with investments and operational costs[47] and cash inflow associated with the receipt of revenues from providing of services by the company.
Financial performance of the project is provided in Table 8 below.
Table 8. Financial indicators of the project

Revenues without VAT (ths EUR)	Cash flow (ths EUR)	dr (discount rate)	NPV (ths EUR)	IRR (%)	Residual value (ths EUR)
127 971 978.6	-142 299 925	14%	-32 169 801	<0%	974 583

[40] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf
[41] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf
[42] http://pages.stern.nyu.edu/~adamodar/pc/archives/ctryprem03.xls
[43] http://cdm.unfccc.int/Panels/meth/meeting/11/049/mp49_an14.pdf
[44] http://www.bank.gov.ua/doccatalog/document?id=36544
[45] http://www.finfacts.ie/inflation.htm
[46] http://www.bank.gov.ua/Statist/Stat_data/Exchange_r.xls
[47] Supporting Document 2

The prices for electricity supplied by SPE "Energiya-Novoyavorivsk" LLC as well as natural gas tariffs for the company are provided by NERC of Ukraine[48]; the source of heat prices is Resolution No.844 of the Executive Committee of the Lviv City Council dated 03/10/2003 "On adjustment of tariffs for thermal energy and heat supply services"[49].
When analysing the cash flow the IRR is <0%, which is below the established IRR limit level of 14%. As a result NPV is negative. Therefore the project cannot be considered financially attractive.

Sub-step 2d. Sensitivity analysis.
The sensitivity analysis is conducted to confirm whether the conclusions on the financial / economic attractiveness are stable enough in different substantiated changes of baseline conditions. The following two key factors were considered in sensitivity analysis: investment costs and electrical tariff. According to the Guidelines for additionality (paragraph 17) the sensitivity analysis should be made for key indicators in the range of variation ± 10%.
Table 9. Electricity prices

	-10%	0%	10%
Operational costs	265 155 344.6	265 155 344.6	265 155 345
Investment costs	6 091 141.879	6 091 141.879	6 091 141.879
Company revenues	115 174 780.7	127 971 978.6	140 769 176
Net present value (NPV)	-35 130 368.81	-32 169 800.75	-29 209 232.69
Internal rate of return (IRR)	<0	<0	<0

Table 10. Investment costs

	-10%	0%	10%
Operational costs	265 155 344.6	265 155 345	265 155 344.6
Investment costs	6 700 256.067	6 091 141.879	5 482 027.691
Company revenues	12 797 1978.6	127 971 978.6	127 971 978.6
Net present value (NPV)	-31 667 712.62	-32 169 800.75	-32 671 888.88
Internal rate of return (IRR)	<0	<0	<0

Sensitivity analysis was used to assess the sensitivity of the project to changes that may occur during the project implementation and operation. Analysis of changes of prices for electricity in the range of -10% and +10% demonstrated that the IRR remains <0%. Analysis of investment and operational costs in the range of -10% and +10% demonstrated that the IRR varies between remains <0%. Expenditures that are considered in the framework of the project are high, and increase of expenditures will result in a negative NPV. However, even in case of expected price of the investment and the income from the sale of ERUs the project is not viable and will bring too little profit even in case of credit financing of the project.
Outcome of Step 2: sensitivity analysis consistently supports (for a realistic range of assumptions) the conclusion that the project is unlikely to be financially / economically attractive.

Step 3: Barrier Analysis
According to the Guidelines of additionality the barrier analysis was not conducted.

Step 4: Common practice analysis

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

[48] http://expert-ua.info/document/archiveiv/law3hguwt.htm

[49] http://www.lte.lviv.ua/?catalog=819

Analysis of other activity similar to the one proposed in the Project demonstrated the absence of similar projects in Ukraine.
The existing practice of operation of existing capacities represented in the baseline option chosen for this Project is the common one for Ukraine. Due to the current practice all new implementations are borne by electricity generating companies, and the companies engaged in electricity generation do not have any incentive to implement new equipment.

Outcome of Sub-step 4a: Since there are no similar projects in Ukraine, there is no need to conduct analysis of similar project activity.

Sub-step 4b. Discussion of any similar Options that are occurring
N/A

According to the "Tool for the demonstration and assessment of additionality"[50] (Version 06.0.0) all steps are satisfied but there are still some obstacles.
One of them is additional costs for commissioning of new P-4-21/3 No.1 steam turbine, T4-2UZ generator, P-6-35/3M No.2 steam turbine, T6-2UZ generator and gas turbine unit (GTU) with DZh59L3 engine and T202UZ generator.

Barrier is associated with the structure of existing tariffs for electricity regulated by the state, which do not include depreciation and investment needs of the suppliers of natural gas. This situation leads to a constant shortage of funds and the inability to timely implement major repairs, ensure equipment operation and invest in modernization and infrastructure development.

We conclude that all of the above may interfere with the implementation of the proposed project as well as other alternatives – partial project activity (implementation of not all of project equipment) without application of Joint Implementation mechanism.

However, one of the alternatives is the continuation of "business as usual." Since the obstacles identified above are directly related to the investment in modernization of CHP plant energy efficiency system, there are no obstacles to further TPP operation in normal mode. Therefore the identified obstacles cannot prejudice the introduction of at least one alternative scenario - continuation of "business as usual."

Conclusion
Based on the above analysis we can conclude that the project is additional.

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

The project boundary includes the territory of Novoyavorivska TPP where the project will be implemented, new steam turbines and a gas turbine unit.
Figures below illustrate the project boundary for the baseline and the project scenario.

[50] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf

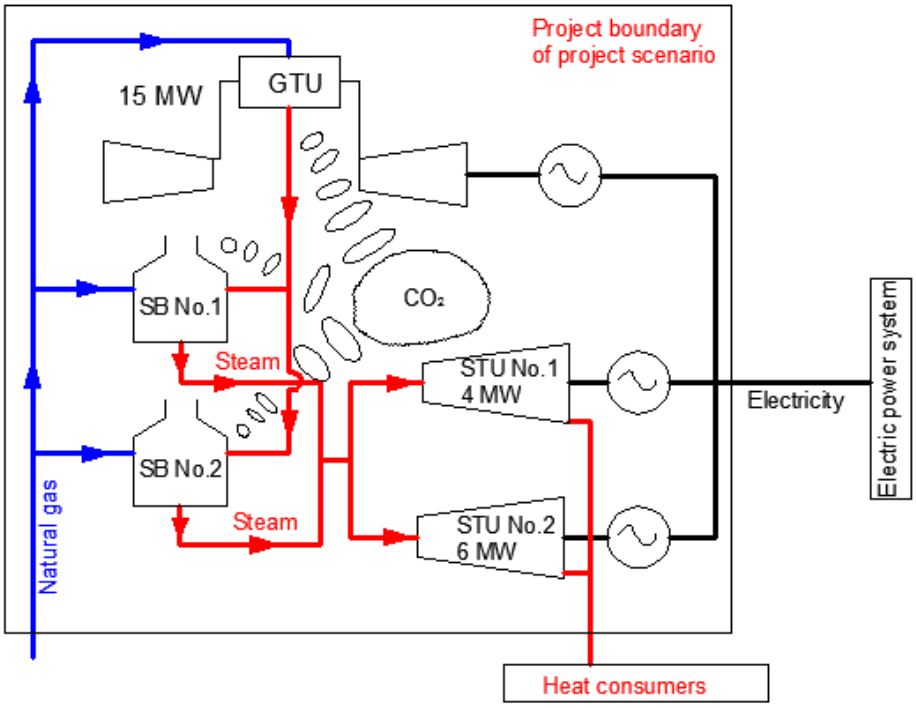

Figure 6. Project boundary of project scenario

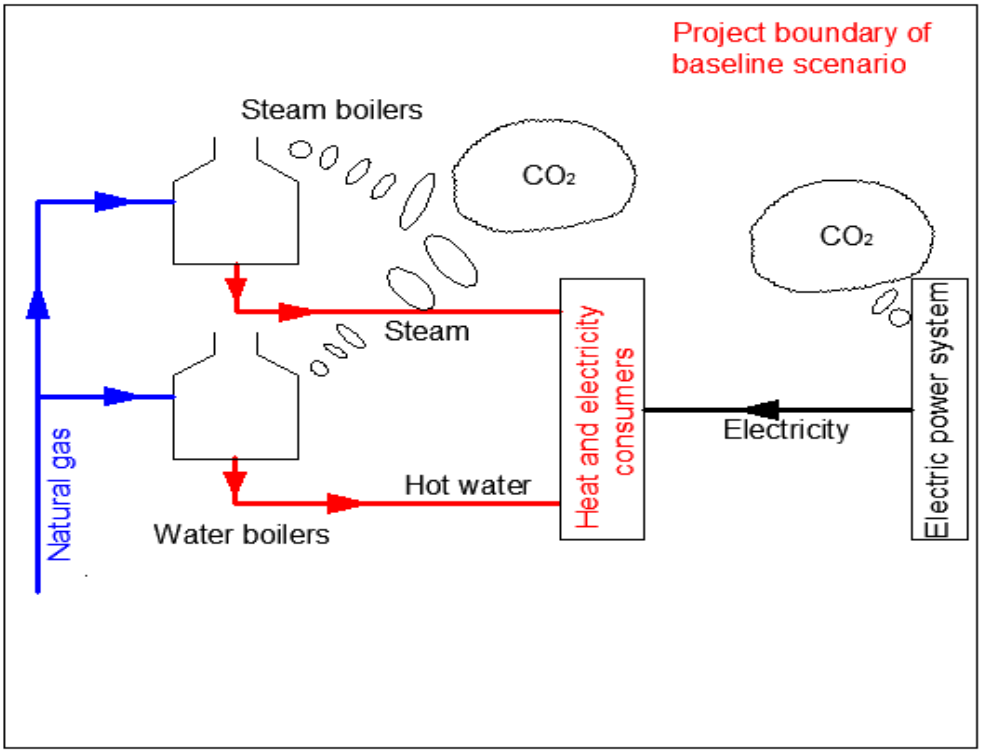

Figure 7. Project boundary for baseline scenario

The table below provides the list of gas emission sources, which are included in or excluded from the Project boundary.

Table 11. An overview of all sources of emissions included into the Project boundary

	Source	Gas	Included / Excluded	Substantiation / explanation
Baseline scenario	Emissions due to electricity generation in Ukrainian power grid	CO_2	Yes	Main emission source in the baseline scenario
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
	Emissions due to natural gas consumption in the course of heat production at Novoyavorivska TPP	CO_2	Yes	Main emission source in the baseline scenario
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
Project activity	Emissions due to heat and electricity generation at Novoyavorivska TPP	CO_2	Yes	Main emission source in the project scenario
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification

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

The baseline was set on February 20, 2012, by the project developer:
"ORELAC GmBH".
Landstrasse 8, 9491, Ruggell, Liechtenstein
Markus Emil Buchel, Director
Phone: + 423 233 44 50
E-mail: konsul@konsulatrussland.li
ORELAC GmBH is a project participant (stated in Annex 1).

CEP Carbon Emissions Partners S.A.
Fabian Knodel, Directer
52 Route de Thonon, Geneva, Casepostale 170 CH-1222 Vésenaz, Switzerland
Phone: +41 (76) 3461157
E-mail: 0709bp@gmail.com
CEP Carbon Emissions Partners S.A. is a project participant (stated in Annex 1).

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

The starting date of the project: 24/12/2003
24/12/2003 – Registering the investment project No.119 implemented in the territory of special economic zone "Yavoriv" Science Park.

C.2. Expected operational lifetime of the project:

The actual average working life of new general-purpose equipment is estimated to be up to 25 years, therefore the project lifetime is deemed 25 years, or 300 months, from January 1, 2004, to December 31, 2028.

C.3. Length of the crediting period:

The length of the crediting period, which is 22 years, or 264 months: 01/01/2007- 31/12/2012 (6 years, or 72 months); if the Kyoto Protocol is prolonged: 01/01/2013- 31/12/2028 (16 years, or 192 months).

The date on which the first emission reductions are expected to be generated beginning 2007 was taken as the starting date of the crediting period. According to the Kyot Protocol to the UN Framework Convention on Climate Change, the first commitment period lasts for 5 years (from 01/01/2008 to 31/12/2012), so the first emission reduction units will be generated beginning 01/01/2008. The end date of the crediting period is the end date of the commitment period according to the Emission Reductions Purchase Agreement under which the project owner shall transfer to the buyer verified greenhouse gases emission reductions resulting from the project, which is 01/01/2013-31/12/2028.

The crediting period can be prolonged beyond 2012 upon approval by the Host Party.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

JI project monitoring is collection and archiving of all relevant data necessary for determining the baseline and estimating anthropogenic emissions by sources of GHGs within the JI project boundary, as well as leakage, when applicable.
This monitoring plan is intended to set the standard for SPE "Energiya-Novoyavorivsk" LLC (Novoyavorivska TPP) to carry out the monitoring and verification of data on the Project performance. The monitoring plan should comply with all applicable JI principles, recommendations and methodologies.
The monitoring plan is developed in line with the "Guidance on criteria for baseline setting and monitoring" Version 03[51], paragraph 9 (a), namely using a JI-specific approach.

According to the monitoring plan for the Project, the following three parameters will be measured with relevant metering devices on a regular basis:

- Volume of natural gas combusted in the course of heat and electricity generation in period *y* ($FC_{NG,p,y}$).
- Electricity supplied to consumers, which would be consumed from the grid in period *y* in the absence of the JI project ($EG_{Elec,b,y}$).
- Heat generation to be supplied under the project activity in period *y* ($HG_{Pr,b,y}$).

Noteworthy, the measurement of these three parameters is part of the customary practice of operation of equipment installed under the Project at SPE "Energiya-Novoyavorivsk" LLC (Novoyavorivska TPP).
The following data for the reporting period will be annually verified during monitoring report preparation and used for calculation of Project emission reductions:

- Net calorific value for natural gas in period *y* ($NCV_{NG,y}$).
- Carbon dioxide emission factor for electricity generation by thermal power plants connected to Ukrainian grid, in period *y* ($EF_{Elec,y}$).
- Carbon emission factor in the course of natural gas combustion in period y, ($EF_{C,NG,y}$);
- Carbon oxidation factor in the course of natural gas combustion in period y, ($OXID_{NG,y}$).

The figure below illustrates the devices used for monitoring during the crediting period.

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

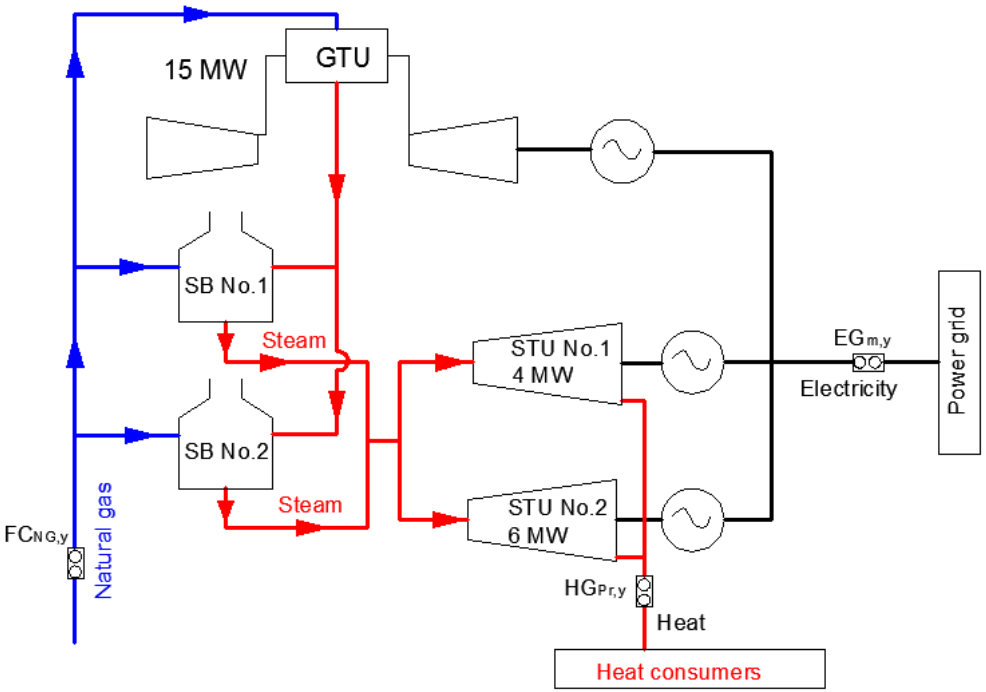

Figure 8.Parameters and metering devices for monitoring during the crediting period

At a certain stage of the Project, the monitoring plan should be revised and amended to reflect the changes in the circumstances of the activity. In adiition, the monitoring plan may require amendments as JI rules and principles are developed.

Project management and operational activity are within the scope of responsibility of SPE “Energiya-Novoyavorivsk” LLC (Novoyavorivska TPP) as project operator. From the standpoint of this monitoring plan, the key responsibility of the project operator is accurate and systematic monitoring of project implementation as well as activity aimed at generation of emission reductions.

The operator is responsible for implementation of operational and management structure, which corresponds to requirements of the project and this monitoring plan.

The scope of responsibility of the project operator concerning the monitoring system is summarized below.

Monitoring system

- To revise monitoring plan and propose amendments to it, if necessary
- To develop and implement management and operational system
- To create and maintain due condition of the monitoring system and implement the monitoring plan

Data collection

- To create and maintain the system of assessment and collection of data on all monitoring plan indicators
- To verify data quality and data collection procedure on a regular basis
- To calibrate metering devices on a regular basis

Data processing

- To input data into monitoring logs
- To use monitoring logs for the calculation of emission reductions

Data storage system

- To implement the account system
- To store and keep records (in paper format for audit)
- To implement the system of confirmation (by signature) of filled-in electronic tables
- To store all monitoring data for two years after the end of the crediting period.

Monitoring and reporting on primary activity

- To analyse data and compare Project indicators with target indicators
- To analyse system problems and recommend ways of their resolution (performance management)
- To prepare and analyse periodic reports.

Training and improvement of qualification

- To develop and conduct training and testing of personnel, and create the feedback system wthin the monitoring plan

- To ensure that relevant employees are duly qualified and prepared to comply with the requirements of this monitoring plan.

Quality assurance, audit and verification

- To create and maintain the quality assurance system to guarantee the transparency and possibility of auditing and verification
- To prepare, promote and coordinate auditing and verification activities.

Data and parameters not monitored throughout the crediting period, available at the stage of PDD development:

$\eta_{NG,Boiler}$	-	Efficiency of natural-gas fired boilers, which would supply heat to consumers in the absence of the project activity, %

Data and parameters monitored throughout the crediting period:

$FC_{NG,p,y}$	-	Natural gas consumption in the course of heat and electricity generation in period *y*, ths m^3
$EG_{Elec,b,y}$	-	Electricity supplied to consumers, which would have been consumed from the grid in the absence of the JI project in period *y*, MWh
$HG_{Pr,y}$	-	Heat supplied to consumers in period *y*, under the project scenario, TJ
$NCV_{NG,y}$	-	Net calorific value for natural gas in period *y*, TJ/ths m^3
$EF_{Elec,y}$	-	Carbon dioxide emission factor for electricity generation by thermal power plants connected to the Ukrainian grid, t CO_2/MWh
$EF_{C,NG,y}$	-	Carbon emission factor in the course of natural gas combustion in perio *y*, t C/TJ
$OXID_{NG,y}$	-	Carbon oxidation factor in the course of natural gas combustion in period *y*, relative units

Data and parameters not monitored throughout the crediting period but determined only once, which are not available at the stage of project documentation development: none.

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

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

Data/Parameter	$FC_{NG,p,y}$
Data unit	ths m^3

Description	Natural gas consumed for heat and electricity generation in period *y*
Time of determination/monitoring	Annually
Source of data (to be) used	Information provided by the Project participant SPE "Energiya-Novoyavorivsk" LLC (Novoyavorivska TPP)
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	1-TEP form report
QA/QC procedures (to be) applied	Gas meters are subject to regular calibration in accordance with manufacturer's requirements and state standards of Ukraine
Any comment	Data will be archived in paper and electronic form

Data/Parameter	$NCV_{NG,y}$					
Data unit	GJ/ths m^3					
Description	Net calorific value of natural gas in period *y*					
Time of determination/monitoring	Every year					
Source of data (to be) used	National inventory report of anthropogenic greenhouse gas emissions by sources and removals by sinks in Ukraine for 1990-2009[52]					
Value of data applied (for ex ante calculations/determinations)	Year	2007	2008	2009	2010	2011
	$NCV_{NG,y}$	33.85	34.0	34.1	34.1	34.1

[52] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr_2009_nir_25may.zip

Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	N/A
Any comment	Data will be archived in paper and electronic form.

Data/Parameter	$EF_{C,NG,y}$
Data unit	t C/TJ
Description	Carbon emission factor in the course of natural gas combustion in period *y*
Time of determination/monitoring	Annually
Source of data (to be) used	The "National inventory report of anthropogenic greenhouse gas emissions by sources and removals by sinks in Ukraine for 1990-2010"[53]
Value of data applied (for ex ante calculations/determinations)	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to "Guidance on criteria for baseline setting and monitoring" [54]

	2007	2008	2009	2010	2011
Natural gas, t C/TJ	15.16	15.17	15.20	15.17	15.17

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

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

QA/QC procedures (to be) applied	Officially approved national data that are actual at the moment of monitoring report preparation will be used.
Any comment	Information will be archived in paper and electronic form.

Data/Parameter	$OXID_{NG,y}$
Data unit	Relative units
Description	Carbon oxidation factor in the course of natural gas combustion in period y
Time of determination/monitoring	Annually
Source of data (to be) used	The "National inventory report of anthropogenic greenhouse gas emissions by sources and removals by sinks in Ukraine for 1990-2010"[55]
Value of data applied (for ex ante calculations/determinations)	See nested table below
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Carbon oxidation factor in the course of natural gas combustion is used to determine the default carbon dioxide emission factor for stationary combustion of fossil fuels in Ukraine. The data source for this parameter is the National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine, based on approved national data.
QA/QC procedures (to be) applied	Officially approved national data that are actual at the moment of the monitoring report preparation will be used.
Any comment	Information will be archived in paper and electronic form.

	2007	2008	2009	2010	2011
Natural gas, relative units	0.995	0.995	0.995	0.995	0.995

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

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

GHG emissions in the project scenario:

The project activity provides for GHG emissions due to natural gas consumption in the course of heat and electricity generation.

According to the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" Version 02, project emissions (PE_y) during period y are calculated by the following formula:

$$PE_y = FC_{NG,p,y} \times COEF_{NG,y} \quad [1]$$

where:

- PE_y - Project GHG emissions due to natural gas combustion in the course of heat and electricity generation in period *y*, t CO_2e;
- $FC_{NG,p,y}$ - Natural gas combusted in the course of heat and electricity generation in period *y*, ths m^3;
- $COEF_{NG,y}$ - CO_2 emission factor for natural gas in period *y*, t CO_2/ths m^3;
- *[NG]* - Natural gas combustion system;
- *[p]* - Project emissions
- *[y]* - Monitoring period.

CO_2 emission factor for natural gas in period y ($COEF_{NG,y}$) is calculated according the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion", Version 02, by the following formula:

$$COEF_{NG,y} = NCV_{NG,y} x EF_{CO2,NG,y} \quad [2]$$

where:

- $COEF_{NG,y}$ - CO_2 emission factor for natural gas in period *y*, t CO_2/ths m^3;
- $NCV_{NG,y}$ - Net calorific value of natural gas in period *y*, TJ/ths m^3;

$EF_{CO2,NG,y}$ - default carbon dioxide emission factor for stationary combustion of natural gas, in the project scenario, t CO_2 /TJ;
$[NG]$ - Natural gas combustion system;
$[y]$ - Monitoring period.

Calculation of default carbon dioxide emission factor for stationary combustion of natural gas in the project scenario ($EF_{CO2,NG,y}$):

$$EF_{CO_2,NG,y} = EF_{C,NG,y} \cdot OXID_{NG,y} \cdot 44/12 \quad [3]$$

Where:
$EF_{CO2,NG,y}$ – default carbon dioxide emission factor for stationary combustion of natural gas, in the project scenario t CO_2 /TJ;
$EF_{C,NG,y}$ - carbon emission factor in the course of natural gas combustion in period y, t C/TJ;
$OXID_{NG,y}$ - carbon oxidation factor in the course of natural gas combustion in period y, relative units;
$44/12$ - stoichiometric ratio between the molecular weight of carbon dioxide and carbon, t CO_2 /t C;
[NG] – Natural gas combustion system;
[y] – Monitoring period.

The calculation results are presented in tables below. The calculations are provided in Supporting Document 1 attached to the PDD.

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

Data/Parameter	$EG_{Elec,b,y}$
Data unit	MWh
Description	Electricity supplied to consumers, which would be consumed from the grid in period *y* in the absence of the project
Time of determination/monitoring	Annually
Source of data (to be) used	Information provided by the Project participant SPE "Energiya-Novoyavorivsk" LLC (Novoyavorivska TPP)

Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	6-NERC form report
QA/QC procedures (to be) applied	Electricity meters are subject to calibration in accordance with manufacturer's requirements and state standards of Ukraine.
Any comment	Information will be archived in paper and electronic form.

Data/Parameter	$HG_{Pr,b,y}$
Data unit	TJ
Description	Net heat generation to be supplied under the project activity in period *y*
Time of determination/monitoring	Annually
Source of data (to be) used	Information provided by the Project participant SPE "Energiya-Novoyavorivsk" LLC (Novoyavorivska TPP)
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	1-S form report
QA/QC procedures (to be) applied	Heat meters are subject to calibration in accordance with manufacturer's requirements and state standards of Ukraine.

Any comment	Information will be archived in paper and electronic form.

Data/Parameter	$EF_{C,NG,y}$
Data unit	t C/TJ
Description	Carbon emission factor in the course of natural gas combustion in period *y*
Time of determination/monitoring	Annually
Source of data (to be) used	The "National inventory report of anthropogenic greenhouse gas emissions by sources and removals by sinks in Ukraine for 1990-2010"[56]
Value of data applied (for ex ante calculations/determinations)	2007: Natural gas, t C/TJ: 15.16; 2008: 15.17; 2009: 15.20; 2010: 15.17; 2011: 15.17
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to "Guidance on criteria for baseline setting and monitoring" [57]
QA/QC procedures (to be) applied	Officially approved national data that are actual at the moment of monitoring report preparation will be used.
Any comment	Information will be archived in paper and electronic form.

Data/Parameter	$OXID_{NG,y}$
Data unit	Relative units

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

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

Description	Carbon oxidation factor in the course of natural gas combustion in period y
Time of determination/monitoring	Annually
Source of data (to be) used	The "National inventory report of anthropogenic greenhouse gas emissions by sources and removals by sinks in Ukraine for 1990-2010"[58]
Value of data applied (for ex ante calculations/determinations)	2007: Natural gas, relative units: 0.995; 2008: 0.995; 2009: 0.995; 2010: 0.995; 2011: 0.995
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Carbon oxidation factor in the course of natural gas combustion is used to determine the default carbon dioxide emission factor for stationary combustion of fossil fuels in Ukraine. The data source for this parameter is the National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine, based on approved national data.
QA/QC procedures (to be) applied	Officially approved national data that are actual at the moment of the monitoring report preparation will be used.
Any comment	Information will be archived in paper and electronic form.

Data/Parameter	$EF_{Elec,y}$
Data unit	t CO_2/MWh
Description	Carbon dioxide emission factor for electricity generation by thermal power plants connected to the national power grid of Ukraine in period *y*
Time of determination/monitoring	Every year
Source of data (to be) used	For 2007 – according to Table 8 ("Emission factors for the Ukrainian

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

<table>
<tr><td></td><td>grid 2006-2012”) of Annex 2 (“Standardized emission factors for the Ukrainian electricity grid”) to “Ukraine - Assessment of new calculation of CEF”, verified by TUV SUD Industrie Service GmbH, 17.08.2007;[59]
Carbon dioxide emission factor for electricity consumption in 2008 are taken from the Decree No.62 of the National Environmental Investment Agency of Ukraine (NEIAU) dated 15.04.2011 "On approval of carbon dioxide emission factor in 2008";[60]
Carbon dioxide emission factor for electricity consumption in 2009 are taken from the Decree No.63 of NEIAU dated 15.04.2011 "On approval of carbon dioxide emission factor in 2009";[61]
Carbon dioxide emission factor for electricity consumption in 2010 are taken from the Decree No.43 of NEIAU dated 28.03.2011 "On approval of carbon dioxide emission factor in 2010";[62]
Carbon dioxide emission factor for electricity consumption in 2011 are taken from the Decree No.75 of NEIAU dated 12.05.2011 "On approval of carbon dioxide emission factor in 2011”.[63]</td></tr>
<tr><td>Value of data applied (for ex ante calculations/determinations)</td><td><table>
<tr><td>Year</td><td>2007</td><td>2008</td><td>2009</td><td>2010</td><td>2011</td></tr>
<tr><td>$EF_{elec,y}$</td><td>0.807</td><td>1.055</td><td>1.068</td><td>1.067</td><td>1.063</td></tr>
</table></td></tr>
<tr><td>Justification of the choice of
data or description of measurement methods and</td><td>If other carbon dioxide emission factors associated with electricity consumption are approved for Ukrainian grids, the baseline will be recalculated for any reporting year according to the Monitoring Plan</td></tr>
</table>

[59] http://ji.unfccc.int/UserManagement/FileStorage/46JW2KL36KM0GEMI0PHDTQF6DVI514

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

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

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

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

procedures (to be) applied	
QA/QC procedures (to be) applied	N/A
Any comment	Information will be archived in paper and electronic form.

Data/Parameter	$\eta_{NG,Boiler}$
Data unit	%
Description	Efficiencyof natural gas fired boilers, which would supply heat to consmers in the absence of the project activity
Time of determination/monitoring	Fixed value. Defined during determination.
Source of data (to be) used	"Tool to determine the baseline efficiency of thermal or electric energy generation systems" Version 1[64]
Value of data applied (for ex ante calculations/determinations)	92
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Default value
QA/QC procedures (to be) applied	According to the "Tool to determine the baseline efficiency of thermal or electric energy generation systems" Version 01[65]
Any comment	Data to calculate greenhouse gas emissions in the project year will be archived in paper and electronic form.

[64] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-09-v1.pdf

[65] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-09-v1.pdf

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

GHG emissions in the baseline scenario:

Baseline emissions during period y are calculated by the following formula (BE_y):

$$BE_y = BE_{Elec,y} + BE_{Ther,y} \quad [4]$$

where:

BE_y - Total baseline GHG emissions in period y, t CO_2e;
$BE_{Elec,y}$ - Baseline GHG emissions due to electricity generation into the Ukrainian grid in period y, t CO_2e;
$BE_{Ther,y}$ - Baseline GHG emissions due to heat generation in period y, t CO_2e;
[Elec] - Electricity generation system;
[Ther] - Heat generation system;
$[y]$ - Monitoring period.

Baseline emissions during period y due to electricity production in the Ukrainian grid ($BE_{Elec,y}$):

$$BE_{Elec,y} = EG_{Elec,b,y} \times EF_{Elec,y} \quad [5]$$

where:

$BE_{Elec,y}$ - Baseline GHG emissions due to electricity generation into the Ukrainian grid in period y, t CO_2e;
$EG_{Elec,b,y}$ - Electricity supplied to consumers, which would have been consumed from the grid in period y in the absence of the JI project, MWh;
$EF_{Elec,y}$ - Carbon dioxide emission factor for electricity generation by thermal power plants connected to the Ukrainian grid in period y, t CO_2/MWh;
[Elec] - Electricity generation system;
[b] - Baseline emissions
$[y]$ - Monitoring period.

Baseline emissions in the course of heat generation by a boiler house in the ansence of the project activity in period y ($BE_{Ther,y}$):

$BE_{Ther,y} = HG_{Pr,b,y} \times EF_{Heat,y}$ [6]

where:

$BE_{Ther,y}$ - Baseline GHG emissions due to heat generation in period *y*, t CO_2e;

$HG_{Pr,b,y}$ - Heat supplied to consumers in the project scenario in period *y*, TJ;

$EF_{Heat,y}$ - CO_2 emission factor for natural-gas fired boilers which would generate heat for consumers in the absence of the project in period *y*, t CO_2/TJ;

[Heat] - Gas boiler heat generation system;

[*Ther*] - Thermal energy generation system;

[*Pr*] - System of heat supply to consumers;

[b] - Baseline emissions

[*y*] - Monitoring period.

Calculation of CO_2 emission factor for heat generation in the baseline scenario in period y ($EF_{heat,y}$):

$$EF_{Heat,y} = \frac{EF_{CO2,NG,y}}{\eta_{NG,Boiler}} \times 100 \quad [7]$$

where:

$EF_{Heat,y}$ - CO_2 emission factor for natural-gas fired boilers which would generate heat for consumers in the absence of the project in period *y*, t CO_2/TJ;

$EF_{CO2,NG,y}$ - default carbon dioxide emission factor for stationary combustion of natural gas, in the baseline scenario t CO_2 /TJ;

$\eta_{NG,Boiler}$ - Efficiency of natural-gas fired boilers, which would generate heat for consumers in the absence of the project, %

[Heat] - Heat generation system;

[*NG*] - Natural gas combustion system;

[*Boiler*] - System of natural-gas fired boilers;

$[y]$ - Monitoring period.

Calculation of default carbon dioxide emission factor for stationary combustion of natural gas in the baseline scenario ($EF_{CO2,NG,y}$):

$$EF_{CO_2,NG,y} = EF_{C,NG,y} \cdot OXID_{NG,y} \cdot 44/12 \quad [8]$$

Where:

$EF_{CO2,NG,y}$ – default carbon dioxide emission factor for stationary combustion of natural gas, in the baseline scenario, t CO_2 /TJ;

$EF_{C,NG,y}$ - carbon emission factor in the course of natural gas combustion in period y, t C/TJ;

$OXID_{NG,y}$ - carbon oxidation factor in the course of natural gas combustion in period y, relative units;

$44/12$ - stoichiometric ratio between the molecular weight of carbon dioxide and carbon, t CO_2 /t C;

[NG] – Natural gas combustion system;

[y] – Monitoring period.

The calculation results are presented in tables below. The calculations are provided in Supporting Document 1 attached to the PDD.

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

D.1.2.1. Data to be collected in order to monitor emission reductions from the project, and how these data will be archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

Not applicable as Option 1 is chosen.

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

reductions in units of CO_2 equivalent):

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

CH_4 leakage is possible due to production, processing, liquefaction, transportation, regasification and distribution of natural gas used in the Project as well as of fossil fuels in the grid in the absence of the Project. This leakage was not considered for simplification and conservativeness.

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

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

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

Not applicable.

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

Reduction of GHG emissions under the Project (ER_y) is calculated by the formula:

$$ER_y = BE_y - PE_y \quad [9]$$

where:

ER_y - Total GHG emission reduction in period y, t CO_2e;

PE_y - Project GHG emissions in period y, t CO_2e;

BE_y - Baseline GHG emissions in period y, t CO_2e;

$[y]$ - Monitoring period.

The calculation results are presented in tables below. The calculations are provided in Supporting Document 1 attached to the PDD.

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

In order to ensure safe and stable operation of the equipment installed at the CHP, quality control and quality assurance procedures are undertaken in line with effective requirements and regulations. According to these requirements of the quality control system, regular maintenance and testing of equipment and tools are implemented. All the metering equipment is regularly verified. Information on the calibration is archived and can be verified anytime. Verification of conformity of data obtained and calculation of emission reductions will take place every month.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
D.1.1.2 $FC_{NG,p,y}$	Low	Natural gas flow meters will be calibrated in accordance with manufacturer's requirements and Ukrainian legislation
D.1.1.3 $EG_{Elec,b,y}$	Low	Electricity meters will be calibrated in accordance with manufacturer's requirements and Ukrainian legislation
D.1.1.3 $HG_{Pr,b,y}$	Low	Heat flow meters will be calibrated in accordance with manufacturer's requirements and Ukrainian legislation

In order to ensure the conservativeness of the parameters, metering equipment undergoes regular calibration and the newest versions of norms and specifications are used. In the absence of the newest versions, the previous versions should be used.
Verification (calibration) of metering devices is carried out in accordance with manufacturers' manuals, approved metering devices verification/calibration methodologies and national standards of Ukraine.
All readings are checked daily. Data other than stated in the PDD are also monitored to ensure stable operation of equipment.
Damaged equipment must be repaired or replaced as soon as possible.

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

Monitoring, collection, registering, archiving and reporting of monitored data, as well as periodic verification of metering devices lie within the scope of responsibility of Production and Technical Department of SPE "Energiya-Novoyavorivsk" (Novoyavorivska TPP). The management structure includes administrative departments of the Supplier and project developers (ORELAC GmBH). The data will be transferred to the project developer for monitoring report preparation.

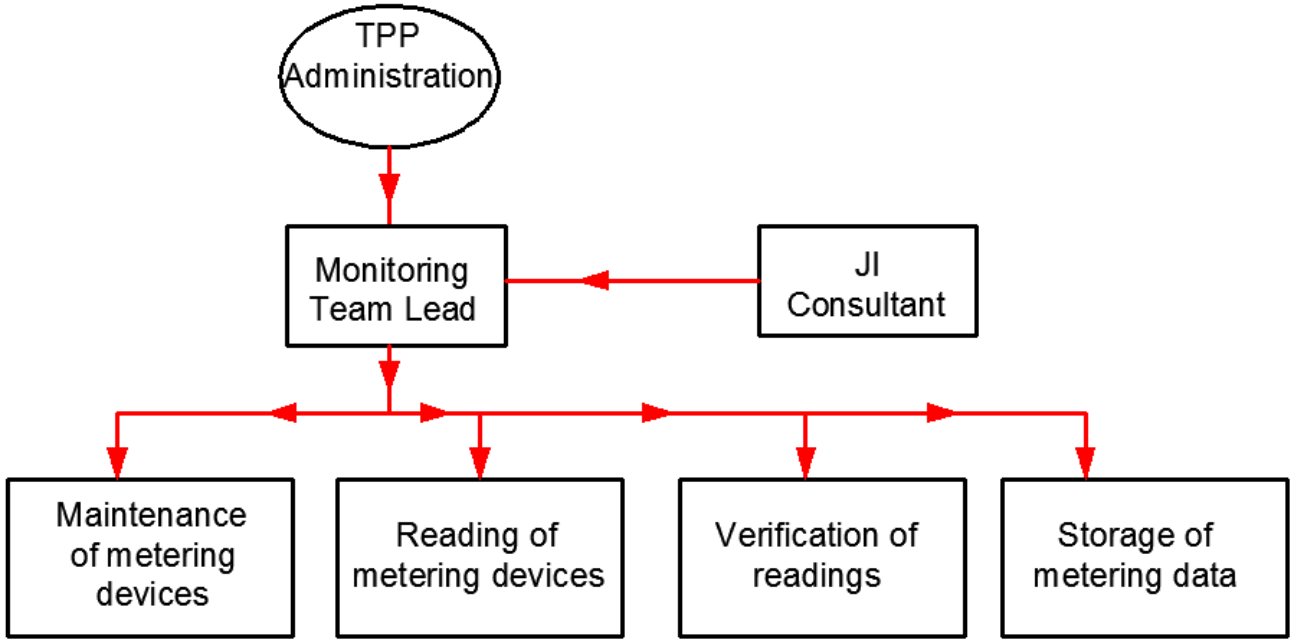

Figure 9. Operational and management structure for monitoring plan implementation

The data subject to monitoring and used for verification of emission reductions will be stored for two years from the last transfer of ERUs.

Measures to be taken in the absence of necessary data due to accident or breakdown of heat and electricity meters:

- In the event of breakdown or absence of heat and electricity meters for eleven days and longer, the amount of heat and electricity supplied is calculated under an additional agreement of the parties;

- The parties shall inform one another if the necessity of removal of meters arises due to repair or verification in entities duly certified under the Ukrainian standards. If the devices are absent for up to ten days, the daily supply of heat and electricity is calculated as the weighted average heat and electricity meter readings for the past ten full days.

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

The monitoring plan was completed on 20/02/2012 by the technical consultant of the Project:
"ORELAC GmBH".
Landstrasse 8, 9491, Ruggell, Liechtenstein
Markus Emil Buchel, Director
Telephone: + 423 233 44 50
E-mail: konsul@konsulatrussland.li

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

The estimation of project emissions was made according to the formulae provided in Section D.1.1.2. The calculation results are presented in tables below. The calculations are provided in Supporting Document 1 attached to the PDD.

Table 12. Estimated project emissions for the period of January 1, 2007 - December 31, 2007

Year	Project emissions (tonnes of CO_2 equivalent)
2007	31 190
Total (t CO_2e)	**31 190**

Table 13. Estimated project emissions for the period of January 1, 2008 - December 31, 2012

Year	Project emissions (tonnes of CO_2 equivalent)
2008	72 399
2009	92 792
2010	98 893
2011	85 182
2012	85 182
Total (t CO_2e)	**434 448**

Table 14. Estimated project emissions for the period of January 1, 2013 – December 24, 2028

Year	Project emissions (tonnes of CO_2 equivalent)
2013	85 182
2014	85 182
2015	85 182
2016	85 182
2017	85 182
2018	85 182
2019	85 182
2020	85 182
2021	85 182
2022	85 182
2023	85 182
2024	85 182
2025	85 182
2026	85 182

2027	85 182
2028	85 182
Total (t CO_2e)	**1 362 912**

E.2. Estimated leakage:

All emissions due to fossil fuel (natural gas) combustion are included into potential project emissions, not leakage, because fuel combustion occurs on-site and is included into the project boundary.

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

Since no leakage is expected, the sum of E.1 and E.2 will amount to E.1.

E.4. Estimated baseline emissions:

Baseline emissions were estimated in accordance with the formulae provided in Section D.1.1.4. The calculation results are presented in tables below. The calculations are provided in Supporting Document 1 attached to the PDD.

Table 15. Estimated baseline emissions for the period of January 1, 2007 - December 31, 2007

Year	Estimated baseline emissions (tonnes of CO_2 equivalent)
2007	33 250
Total (t CO_2e)	**33 250**

Table 16. Estimated baseline emissions for the period of January 1, 2008 - December 31, 2012

Year	Estimated baseline emissions (tonnes of CO_2 equivalent)
2008	107 373
2009	144 457
2010	154 742
2011	129 109
2012	129 109
Total (t CO_2e)	**664 790**

Table 17. Estimated baseline emissions for the period of January 1, 2013 - December 24, 2028

Year	Estimated baseline emissions (tonnes of CO_2 equivalent)
2013	129 109
2014	129 109
2015	129 109
2016	129 109

2017	129 109
2018	129 109
2019	129 109
2020	129 109
2021	129 109
2022	129 109
2023	129 109
2024	129 109
2025	129 109
2026	129 109
2027	129 109
2028	129 109
Total (t CO_2e)	**2 065 744**

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

Emission reductions were calculated according to the formula (9) provided in Section D.1.4.
The calculation results are presented in tables below. The calculations are provided in Supporting Document 1 attached to the PDD.

Table 18. Estimated emission reduction for the period of January 1, 2007 - December 31, 2007

Year	Estimated emission reduction (tonnes of CO_2 equivalent)
2007	2 060
Total (t CO_2e)	**2 060**

Table 19. Estimated emission reduction for the period of January 1, 2008 - December 31, 2012

Year	Estimated emission reduction (tonnes of CO_2 equivalent)
2008	34 974
2009	51 665
2010	55 849
2011	43 927
2012	43 927
Total (t CO_2e)	**230 342**

Table 20. Estimated emission reduction for the period of January 1, 2013 - December 24, 2028

Year	Estimated emission reduction (tonnes of CO_2 equivalent)

2013	43 927
2014	43 927
2015	43 927
2016	43 927
2017	43 927
2018	43 927
2019	43 927
2020	43 927
2021	43 927
2022	43 927
2023	43 927
2024	43 927
2025	43 927
2026	43 927
2027	43 927
2028	43 927
Total (t CO_2e)	**702 832**

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

Table 21. Table containing estimated emission reductions for the period prior to the first commitment period from January 1, 2007 to December 31, 2008

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reduction (tonnes of CO_2 equivalent)
2007	31 190	0	33 250	2 060
Total (t CO_2e)	**31 190**	0	**33 250**	**2 060**

Table 22. Table containing estimated emission reductions for the first commitment period from January 1, 2008 to December 31, 2012

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reduction (tonnes of CO_2 equivalent)
2008	72 399	0	107 373	34 974
2009	92 792	0	144 457	51 665

2010	98 893	0	154 742	55 849
2011	85 182	0	129 109	43 927
2012	85 182	0	129 109	43 927
Total (t CO_2e)	**434 448**	0	**664 790**	**230 342**

Table 23. Table containing estimated emission reductions for the period following the first commitment period from January 1, 2013 to December 24, 2028

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reduction (tonnes of CO_2 equivalent)
2013	85 182	0	129 109	43 927
2014	85 182	0	129 109	43 927
2015	85 182	0	129 109	43 927
2016	85 182	0	129 109	43 927
2017	85 182	0	129 109	43 927
2018	85 182	0	129 109	43 927
2019	85 182	0	129 109	43 927
2020	85 182	0	129 109	43 927
2021	85 182	0	129 109	43 927
2022	85 182	0	129 109	43 927
2023	85 182	0	129 109	43 927
2024	85 182	0	129 109	43 927
2025	85 182	0	129 109	43 927
2026	85 182	0	129 109	43 927
2027	85 182	0	129 109	43 927
2028	85 182	0	129 109	43 927
Total (t CO_2e)	**1 362 912**	0	**2 065 744**	**702 832**

SECTION F. Environmental impacts

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

The Project complies with all environmental requirements of the Ukrainian legislation.
Pursuant to p. 10 of Annex E DBN A.2.2-1-2003[66], PP "Tsentr novitnikh tekhnolohii" conducted EIA in 2005.
According to the calculations for the project CHP on the basis of a boiler house, the maximum near-earth concentration of all pollutants for the 1st and the 2nd construction lines do not exceed the MPC. The maximum near-earth concentration of active nitrogen is 0.591 MPC for the first line of construction and 0.501 MPC for the second line of construction.
The near-earth pollutant concentration value in control points will not exceed 0.035 mg/m^3 (0.412 MPC) of nitrogen dioxide. Thus, gas contamination level near Novoiavorivsk will decrease after the boiler house reconstruction.
Based on the calculations of noise level, a Sanitary Protection Zone was built. There are residential buildings within the boundary of the Zone. The borders are set on the basis of noise level data, because MPC is not exceeded.
Novoyavirovsk citizens were informed through mass-media on the intentions of reconstruction and technical re-equipment of the boiler house. No complaints or proposals have been received since the release.
Thus, the Project will have no negative impact on the environment.

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

As stated above, the environmental impact analysis showed that the effect of the project on the environment is rather positive than negative.

Impact on air environment
The implementation of the project will have a positive imact on the air environment because emissions of NO_x, SO_x, CO and solid particles will decrease due to lower consumption of fuel and grid electricity.

Impact on water medium
The impact on water medium will be unchanged against the baseline scenario. The impact on water medium is regulated according to the Water Code of Ukraine[67] and SNiP 4630-92[68] on determining the maximum allowable concentration for internal water facilities.

Impact on land use
The impact on land use is absent.
Land use is regulated by the Land Code of Ukrane[69] and national technological standard GOST 17.4.1.02.-83[70] "Protection of nature, soil. Classification of chemical substances for pollution control".

[66] http://www.proxima.com.ua/dbn/articles.php?clause=6

[67] http://zakon2.rada.gov.ua/laws/show/213/95-%D0%B2%D1%80

[68] http://www.vashdom.ru/sanpin/4630-88/

[69] http://zakon3.rada.gov.ua/laws/show/2768-14

Impact on biodiversity
There is no impact on biodiversity.

Waste generation, their treatment and disposal
In the course of the project implementation, waste is generated when old equipment and pipes are dismantled.
The problem can be solved through utilization of old equipment parts.

[70] http://www.complexdoc.ru/text/%D0%93%D0%9E%D0%A1%D0%A2%2017.4.1.02-83

SECTION G. Stakeholders' comments

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

The community was informed via mass-media. Information concerning the compliance with environmental safety requirements was published in local "Yavorivshchyna" newspaper on 29/12/2004. All the comments received were positive.
Links to some web releases follow:

- "Vholos" On-line News Agency[71];
- "Lvivska Poshta" On-line News Agency[72].

No negative comments on the project were received.

[71] http://vgolos.com.ua/politic/person/373.html?action=print
[72] http://www.lvivpost.net/content/view/1311/430/

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex 2

BASELINE INFORMATION

The baseline scenario is the continuation of the practice existing prior to the Project implementation. Electricity would be generated by power plants connected to the Ukrainian grid; heat would be generated by the existing or new boilers by natural gas combustion.

Key information on baseline setting is provided in tables below.

Data/Parameter	$EG_{Elec,b,y}$
Data unit	MWh
Description	Electricity supplied to consumers, which would be consumed from the grid in period *y* in the absence of the project
Source of data (to be) used	Information provided by the Project participant SPE "Energiya-Novoyavorivsk" LLC (Novoyavorivska TPP)
Justification of the choice of data or description of measurement methods and procedures (to be) applied	6-NERC form report

Data/Parameter	$HG_{Pr,b,y}$
Data unit	TJ
Description	Net heat generation to be supplied under the project activity in period *y*
Source of data (to be) used	Information provided by the Project participant SPE "Energiya-Novoyavorivsk" LLC (Novoyavorivska TPP)
Justification of the choice of data or description of measurement methods and procedures (to be) applied	1-S form report

Data/Parameter	$EF_{C,NG,y}$
Data unit	t C/TJ
Description	Carbon emission factor in the course of natural gas combustion in period *y*
Source of data (to be) used	The "National inventory report of anthropogenic greenhouse gas emissions by sources and removals by sinks in Ukraine for 1990-2010"[73]
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to "Guidance on criteria for baseline setting and monitoring" [74]

Data/Parameter	$OXID_{NG,y}$

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

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

Data unit	Relative units
Description	Carbon oxidation factor in the course of natural gas combustion in period *y*
Source of data (to be) used	The "National inventory report of anthropogenic greenhouse gas emissions by sources and removals by sinks in Ukraine for 1990-2010"[75]
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Carbon oxidation factor in the course of natural gas combustion is used to determine the default carbon dioxide emission factor for stationary combustion of fossil fuels in Ukraine. The data source for this parameter is the National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine, based on approved national data.

Data/Parameter	$EF_{Elec,y}$
Data unit	t CO_2/MWh
Description	Carbon dioxide emission factor for electricity generation by thermal power plants connected to the national power grid of Ukraine in period *y*
Source of data (to be) used	For 2007 – according to Table 8 ("Emission factors for the Ukrainian grid 2006-2012") of Annex 2 ("Standardized emission factors for the Ukrainian electricity grid") to "Ukraine - Assessment of new calculation of CEF", verified by TUV SUD Industrie Service GmbH, 17.08.2007;[76] Carbon dioxide emission factor for electricity consumption in 2008 are taken from the Decree No.62 of the National Environmental Investment Agency of Ukraine (NEIAU) dated 15.04.2011 "On approval of carbon dioxide emission factor in 2008";[77] Carbon dioxide emission factor for electricity consumption in 2009 are taken from the Decree No.63 of NEIAU dated 15.04.2011 "On approval of carbon dioxide emission factor in 2009";[78] Carbon dioxide emission factor for electricity consumption in 2010 are taken from the Decree No.43 of NEIAU dated 28.03.2011 "On approval of carbon dioxide emission factor in 2010";[79] Carbon dioxide emission factor for electricity consumption in 2011 are taken from the Decree No.75 of NEIAU dated 12.05.2011 "On approval of carbon dioxide emission factor in 2011".[80]
Justification of the choice of data or description of measurement methods and procedures (to be) applied	If other carbon dioxide emission factors associated with electricity consumption are approved for Ukrainian grids, the baseline will be recalculated for any reporting year according to the Monitoring Plan

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

76 http://ji.unfccc.int/UserManagement/FileStorage/46JW2KL36KM0GEMI0PHDTQF6DVI514

77 http://www.neia.gov.ua/nature/doccatalog/document?id=127171

78 http://www.neia.gov.ua/nature/doccatalog/document?id=127172

79 http://www.neia.gov.ua/nature/doccatalog/document?id=126006

80 http://www.neia.gov.ua/nature/doccatalog/document?id=127498

Data/Parameter	$\eta_{NG,Boiler}$
Data unit	%
Description	Efficiencyof natural gas fired boilers, which would supply heat to consmers in the absence of the project activity
Source of data (to be) used	"Tool to determine the baseline efficiency of thermal or electric energy generation systems" Version 1[81]
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Default value

[81] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-09-v1.pdf

Annex 3

MONITORING PLAN

JI project monitoring is collection and archiving of all relevant data necessary for determining the baseline and estimating anthropogenic emissions by sources of GHGs within the JI project boundary, as well as leakage, when applicable.
This monitoring plan is intended to set the standard for SPE "Energiya-Novoyavorivsk" LLC (Novoyavorivska TPP) to carry out the monitoring and verification of data on the Project performance. The monitoring plan should comply with all applicable JI principles, recommendations and methodologies.
The monitoring plan is developed in line with the "Guidance on criteria for baseline setting and monitoring" Version 03[82], paragraph 9 (a), namely using a JI-specific approach.

According to the monitoring plan for the Project, the following three parameters will be measured with relevant metering devices on a regular basis:

- Volume of natural gas combusted in the course of heat and electricity generation in period *y* ($FC_{NG,p,y}$).
- Electricity supplied to consumers, which would be consumed from the grid in period *y* in the absence of the JI project ($EG_{Elec,b,y}$).
- Heat generation to be supplied under the project activity in period *y* ($HG_{Pr,b,y}$).

Noteworthy, the measurement of these three parameters is part of the customary practice of operation of equipment installed under the Project at SPE "Energiya-Novoyavorivsk" LLC (Novoyavorivska TPP).
The following data for the reporting period will be annually verified during monitoring report preparation and used for calculation of Project emission reductions:

- Net calorific value for natural gas in period *y* ($NCV_{NG,y}$).
- Carbon dioxide emission factor for electricity generation by thermal power plants connected to Ukrainian grid, in period *y* ($EF_{Elec,y}$).
- Carbon emission factor in the course of natural gas combustion in period y, ($EF_{C,NG,y}$);
- Carbon oxidation factor in the course of natural gas combustion in period y, ($OXID_{NG,y}$).

Data and parameters monitored:

Data/Parameter	$EG_{Elec,b,y}$
Data unit	MWh
Description	Electricity supplied to consumers, which would be consumed from the grid in period *y* in the absence of the project
Time of determination/monitoring	Subject to monitoring during the crediting period
Source of data (to be) used	Information provided by the Project participant SPE "Energiya-Novoyavorivsk" LLC (Novoyavorivska TPP)
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1

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

Justification of the choice of data or description of measurement methods and procedures (to be) applied	6-NERC form report
QA/QC procedures (to be) applied	Electricity meters are subject to calibration in accordance with manufacturer's requirements and state standards of Ukraine.
Any comment	Information will be archived in paper and electronic form

Data/Parameter	$HG_{Pr,b,y}$
Data unit	TJ
Description	Net heat generation to be supplied under the project activity in period y
Time of determination/monitoring	Subject to monitoring during the crediting period
Source of data (to be) used	Information provided by the Project participant SPE "Energiya-Novoyavorivsk" LLC (Novoyavorivska TPP)
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	1-S form report
QA/QC procedures (to be) applied	Heat meters are subject to calibration in accordance with manufacturer's requirements and state standards of Ukraine.
Any comment	Information will be archived in paper and electronic form

Data/Parameter	$EF_{C,NG,y}$					
Data unit	t C/TJ					
Description	Carbon emission factor in the course of natural gas combustion in period *y*					
Time of determination/monitoring	Annually					
Source of data (to be) used	The "National inventory report of anthropogenic greenhouse gas emissions by sources and removals by sinks in Ukraine for 1990-2010"[83]					
Value of data applied (for ex ante calculations/determinations)		2007	2008	2009	2010	2011
	Natural gas, t C/TJ	15.16	15.17	15.20	15.17	15.17

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

Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to "Guidance on criteria for baseline setting and monitoring" [84]
QA/QC procedures (to be) applied	Officially approved national data that are actual at the moment of monitoring report preparation will be used.
Any comment	Information will be archived in paper and electronic form.

Data/Parameter	$OXID_{NG,y}$
Data unit	Relative units
Description	Carbon oxidation factor in the course of natural gas combustion in period y
Time of determination/monitoring	Annually
Source of data (to be) used	The "National inventory report of anthropogenic greenhouse gas emissions by sources and removals by sinks in Ukraine for 1990-2010"[85]
Value of data applied (for ex ante calculations/determinations)	2007: Natural gas, relative units: 0.995; 2008: 0.995; 2009: 0.995; 2010: 0.995; 2011: 0.995
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Carbon oxidation factor in the course of natural gas combustion is used to determine the default carbon dioxide emission factor for stationary combustion of fossil fuels in Ukraine. The data source for this parameter is the National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine, based on approved national data.
QA/QC procedures (to be) applied	Officially approved national data that are actual at the moment of the monitoring report preparation will be used.
Any comment	Information will be archived in paper and electronic form.

Data/Parameter	$EF_{Elec,y}$
Data unit	t CO_2/MWh
Description	Carbon dioxide emission factor for electricity generation by thermal power plants connected to the national power grid of Ukraine in period *y*
Time of determination/monitoring	Every year
Source of data (to be) used	For 2006-2007 – according to Table 8 ("Emission factors for the Ukrainian grid 2006-2012") of Annex 2 ("Standardized emission factors for the Ukrainian electricity grid") to "Ukraine - Assessment

[84] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf
[85] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

	of new calculation of CEF", verified by TUV SUD Industrie Service GmbH, 17.08.2007;[86] Carbon dioxide emission factor for electricity consumption in 2008 are taken from the Decree No.62 of the National Environmental Investment Agency of Ukraine (NEIAU) dated 15.04.2011 "On approval of carbon dioxide emission factor in 2008";[87] Carbon dioxide emission factor for electricity consumption in 2009 are taken from the Decree No.63 of NEIAU dated 15.04.2011 "On approval of carbon dioxide emission factor in 2009";[88] Carbon dioxide emission factor for electricity consumption in 2010 are taken from the Decree No.43 of NEIAU dated 28.03.2011 "On approval of carbon dioxide emission factor in 2010";[89] Carbon dioxide emission factor for electricity consumption in 2011 are taken from the Decree No.75 of NEIAU dated 12.05.2011 "On approval of carbon dioxide emission factor in 2011".[90]
Value of data applied (for ex ante calculations/determinations)	*Year* | *2007* | *2008* | *2009* | *2010* | *2011* $EF_{elec,y}$ | 0.807 | 1.055 | 1.068 | 1.067 | 1.063
Justification of the choice of data or description of measurement methods and procedures (to be) applied	If other carbon dioxide emission factors associated with electricity consumption are approved for Ukrainian grids, the baseline will be recalculated for any reporting year according to the Monitoring Plan
QA/QC procedures (to be) applied	N/A
Any comment	Information will be archived in paper and electronic form.

[86] http://ji.unfccc.int/UserManagement/FileStorage/46JW2KL36KM0GEMI0PHDTQF6DVI514

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

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

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

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