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

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

"Modernisation of an enterprise regarding fuel switching from fuel oil to natural gas at PFC, LTD".

Sectoral Scope: 1 Energy industries[1].

Version: 05.

Date: January 27, 2010

A.2. Description of the project:

PFC, LTD is the first enterprise in the former Soviet Union, which produces ferronickel from oxidised base in production quantities.

The principal activity of PFC, LTD is provision of services for processing of nickel raw materials produced on commission, production of ferronickel, solid furnace and granulated slag. Ferronickel is produced for the needs of enterprises in Ukraine and abroad.

The proposed project is related to the Fuel Combustion category and includes emissions from carbon fossil fuel combustion. Fuel combustion includes fuel oxidation processes for electric power generation for its further direct use or for transformation into mechanical power.

The main sources of emissions in this category in Ukraine are the Energy sector, Industry and Construction, and Transport, the share of which is nearly 85%[2] of the total emissions in the Fuel Combustion category. Chemical industry is among the biggest industrial fuel consumers in Ukraine after heat energy and iron-and-steel industry. Chemical industry differs by a greater percentage of use of raw fuel.

The technology of production of product on PFC, LTD includes roasting of ore charge in the tubular furnaces, melting the hot cinder on a ferronickel and refining an electro ovens ferronickel. Fuel oil was used for the production purposes according to the baseline scenario. The main consumer of fuel are 4 tubular furnaces of roasting workshop that require the use of substantial volumes of fuel. The emissions of greenhouse gases in the atmospheric air take place due to the incineration of fuel oil in stoves.

Project was initiated in 2004. The primary purpose of the project is to reduce greenhouse gas emissions by switching from fuel oil to natural gas. Reduction of greenhouse gas emissions can be achieved by modernisation of a fuel system.

To fulfill this project the enterprise constructed a gas pipeline connected to the public gas transmission system, which provided use of natural gas instead of fuel oil for combustion in the respective production. To increase efficiency of natural gas using the enterprise replaced gas burners.

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[1] http://cdm.unfccc.int/DOE/scopes.html#13
[2] http://www.menr.gov.ua/cgi-bin/go?node=Nac%20kadastr%20parn%20gaz

Due to the absence of the project for production at the enterprise fuel oil was used as fuel, and the main greenhouse gas emissions from fuel combustion are CO_2 emissions. The proposed project allowed the enterprise to switch from oil fuel to another one – natural gas. Greenhouse gas emissions will be reduced at the expense of the fact that carbon content in fuel oil is much higher than in natural gas, and the lower combustion value of fuel oil is much higher compared to natural gas.

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)	• PFC, LTD • TEST Centre, LLC	No No
British Virgin Island	• RAIDEN VENTURES LIMITED	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 activity will be conducted on the territory PFC, LTD located in urban settlement Pobugskoye. Geographic location of the project is shown on Fig. 1 below.

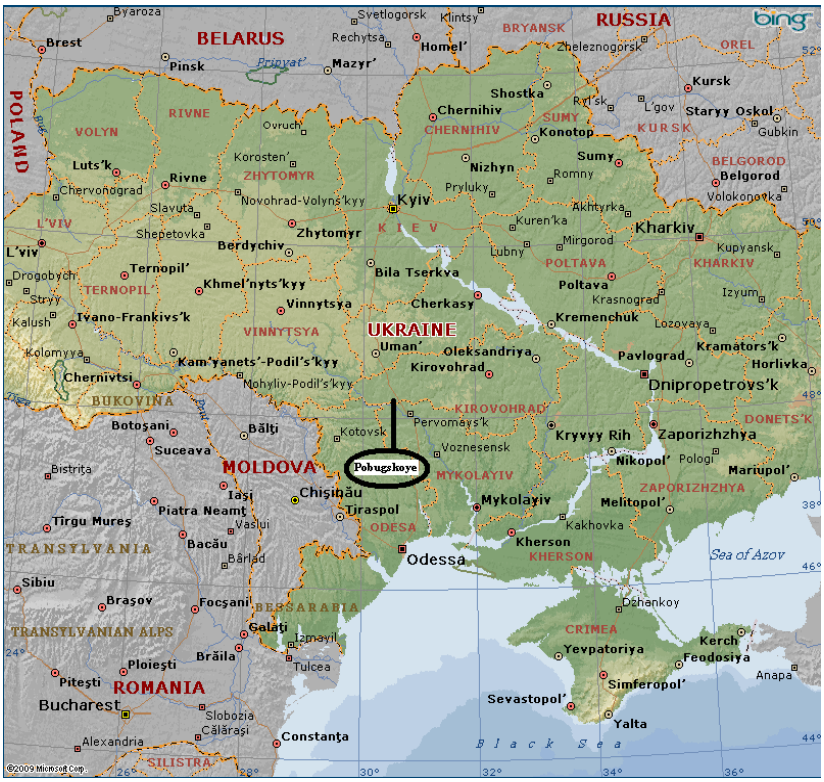

Fig. 1 – Geographic location of the project[3]

[3] http://mappoint.msn.com/%28y1rb4a452hbi2qqom2pucsfe%29/map.aspx

A.4.1.1. Host Party(ies):

Ukraine

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

Golovanivskyi District of Kirovohrad region

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

Urban settlement Pobugskoye

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

The project is located on the territory of PFC, LTD. The enterprise is located in the centre of Ukraine on the territory of Golovaniskyi District of Kirovograd region two kilometres away from river Pivdennyi Buh. The enterprise is connected by a railway broad gauge track with Pidgorodna station of Odessa railway and asphalt covered highways with Golovanivsk and Pervomaisk of Mykolayiv region.

Location of facilities of PFC, LTD is shown in Fig. 2.

Fig. 2 – Location of facilities of PFC, LTD[4]

[4] http://map1.com.ua/130092.html

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

The principal activity of PFC, LTD is provision of services for processing of nickel raw materials produced on commission, production of ferronickel, solid furnace and granulated slag. Ferronickel is produced for the needs of enterprises in Ukraine and abroad.

Greenhouse gas emissions may be reduced by modernisation of a fuel system, particularly replacement of industrial fuel. After completion of construction of a gas pipeline to be connected to the public gas transmission system the enterprise will switch from fuel oil to natural gas.

The major fuel users are 4 pipe furnaces of a roast workshop, which require considerable quantities of fuel. Modernisation allows keeping the engineering performance required for production by the enterprise, and reducing greenhouse gas air emissions by ways of replacement of the fuel used for production at the enterprise.

Until implementation of the proposed project urban settlement Pobugskoye where PFC, LTD is located has not been gasified so modernisation of a fuel system comprises construction of a gas pipeline to provide continuous natural gas supply to the enterprise, and installation of gas burners to provide economic use of natural gas and the possibility to keep the required conditions in a furnace for the respective production.

To use this project in 2005 the enterprise completed construction of a gas pipeline connected to the public gas transmission system. Construction and commissioning of the gas pipeline allowed the enterprise to use natural gas as fuel instead of fuel oil.

To increase efficient use of natural gas in the fuel system of the enterprise PFC, LTD replaced gas burners for 4 pipe furnaces of a roast workshop within a period from 2007 to 2008. Old burners ПГ-35 were replaced with СНГ-54.

The operational group PFC, LTD passed special training from exploitation of the fuel system on natural gas and leading through of the relevant preventive actions of the fuel system.

The personnel of the enterprise are subject to the periodic testing for knowledge of the requirements of safety and accident prevention during work with the fuel system.

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:

Greenhouse gas emissions occur as a result of fuel combustion in 4 pipe furnaces of a roast workshop of PFC, LTD. Emissions reduction occurs as a result of replacement of fuel from fuel oil to natural gas. Emissions are reduced at the expense of the fact that carbon content in fuel oil is much higher than in natural gas, and the lower combustion value of fuel oil is much higher compared to natural gas.

It should be noted that implementation of the project will allow to reduce air emissions of greenhouse gas, which cannot be achieved under the conditions of absence of this project. PFC, LTD has no pecuniary benefit from greenhouse gas emissions reduction. Thus, any reduction in hazardous air emissions achieved within the framework of this joint implementation project will be supplementary.

Realisation of the modernisation above requires considerable investment. The financial condition of the company does not allow implementing the project without attracting investment. The joint implementation project provides the mechanisms allowing attracting financial resources for respective modernisation of the enterprise. The investment required for implementation of the project will be repaid to the investor at the expense of realisation of emissions reduction units generated by this project. Thus only implementation of this joint implementation project will allow generating greenhouse gas emission reductions.

In the current situation in Ukraine transition from fuel oil to natural gas is economically unsound for the enterprise. In consideration of the current fuel prices expenses for natural gas are higher compared to fuel oil.

Switching to natural gas and difficult situation with this fuel in Ukraine forces the enterprise to provide proper conditions for storage of a reserve supply of fuel oil to allow operation of the enterprise under the conditions of absence of natural gas.

Reasonableness of implantation of the project depends on the fuel price difference in Ukraine. Ukraine tends to increase natural gas prices, so the project is gong to be economically unsound for the enterprise in the future.

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

Crediting period starts at the year 2005. The number of units of the set amount will be generated between the beginning of the loan until the end of 2007.

	Years
Length of the crediting period	3
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2005	25197
2006	103883
2007	91542
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	220622
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	73541

The first commitment period under the Kyoto Protocol lasts from 2008 to 2012 year.

	Years
Length of the crediting period	5
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2008	99578
2009	97407
2010	99757
2011	99757
2012	99757
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	496256
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	99251

If after the first commitment period under the Kyoto Protocol its action will is continuing, the crediting period for the project may be extended until the end of the expected operational lifetime of the project.

	Years
Length of the crediting period	8
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2013	99757
2014	99757
2015	99757
2016	99757
2017	99757
2018	99757
2019	99757
2020	99757
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	798056
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	99757

A.5. Project approval by the Parties involved:

The substantiating materials on the possible joint implementation project to obtain a Letter of Endorsement were sent by the source owner to the National Environmental Investment Agency of Ukraine. To this end the National Environmental Investment Agency of Ukraine issued a Letter of Endorsement of 19.11.2009 No. 1382/23/7.

After finalizing of the procedure of determination of the project the final version of project design documentation and determination report will be provided to the National Environmental Investment Agency of Ukraine to obtain am Letter of Approval.

SECTION B. Baseline

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

Because activities on the project provide for switching from fuel oil to natural gas for combustion of a respective type of fuel in production, an approved consolidated methodology ACM0009 "Consolidated methodology for industrial fuel switching from coal or petroleum fuels to natural gas" (Version 3.2)[5] was chosen to determine the baseline under this project. This methodology is intended for the projects providing for switching from coal or fuel oil to natural gas in heat generation processes related to production. The proposed project assumes switching from fuel (fuel oil) to natural gas, so fuel is used for combustion in 4 pipe furnaces of a roast workshop of the enterprise for production. According to the intended purpose of this methodology, the methodology ACM0009 "Consolidated methodology for industrial fuel switching from coal or petroleum fuels to natural gas" (Version 3.2) was also chosen for the proposed project.

The adopted monitoring methodology has been chosen based on the following reasons:

- Prior to the implementation of the project activity, only coal or petroleum fuel (but not natural gas) have been used in the element processes;
- Regulations/programs do not constrain the facility from using the fossil fuels being used prior to fuel switching;
- Regulations do not require the use of natural gas or any other fuel in the element processes;
- The project activity does not increase the capacity of thermal output or lifetime of the element processes during the crediting period (i.e. emission reductions are only accounted up to the end of the lifetime of the relevant element process), nor is there any thermal capacity expansion planned for the project facility during the crediting period;
- The proposed project activity does not result in integrated process change.

According to the intended purpose of this methodology, the project activity does not increase thermal productivity capacity, in which case there is no increase in the heat volume for the project facilities over the crediting period. The methodology contains an algorithm for estimation of baseline emissions, determination of the emission reduction volume, and the monitoring technique to be applied in the proposed project.

The baseline was determined in accordance with the requirements of ACM0009 "Consolidated methodology for industrial fuel switching from coal or petroleum fuels to natural gas" (Version 3.2). To this end the most obvious baseline version was chosen using the following steps.

According to the requirements of ACM0009 "Consolidated methodology for industrial fuel switching from coal or petroleum fuels to natural gas" (Version 3.2), a baseline shall be chosen by the following 4 steps:
1. Determination of realistic and effective alternative fuel uses;
2. Recall of alternatives not consistent with the current laws and regulations;
3. Recall of alternatives, for which there are excessive obstacles;
4. Comparison of economic attractiveness of the remaining alternatives.

[5] http://cdm.unfccc.int/methodologies/DB/2CRBYLJO5JWC9YHBSWJQWYIH2LLGMJ/view.html

Step 1. Determination of realistic and effective alternative fuel uses

The following 4 most obvious alternatives for project documentation under ACM0009 "Consolidated methodology for industrial fuel switching from coal or petroleum fuels to natural gas" (Version 3.2) were chosen to determine the baseline.

Alternative 1.1	Continuation of use of fuel oil as fuel
Alternative 1.2	Switching to other alternative fuel not being natural gas, e.g. biomass
Alternative 1.3	Switching to natural gas under the conditions of absence of a joint implementation project
Alternative 1.4	Switching to natural gas over the period following expiry of the crediting period

1.1. Continuation of use of fuel oil as fuel

The enterprise cannot carry out modernisation and correspondingly construction a gas pipeline connected to the public has transportation system. The enterprise will continue purchasing fuel oil for use as fuel.

1.2. Switching to other alternative fuel not being natural gas, e.g. biomass

Switching to an alternative fuel, such as biomass is quite problematic. Measures for use of alternative fuel in industry are practically not accomplished in Ukraine. Biomass production in Ukraine has not reached the volume sufficient enough to satisfy the needs of the enterprise in fuel completely. There are also great difficulties in organisation of biomass supply to the enterprise.

1.3. Switching to natural gas under the conditions of absence of a joint implementation project

Switching to natural gas under the conditions of absence of a joint implementation project is economically unsound for the enterprise. Realisation of the modernisation above requires considerable investment. The financial condition of the company does not allow implementation of the project without attracting investment, and the joint implementation project provides the mechanisms allowing attraction of financial resources for respective modernisation of the enterprise. In consideration of the current fuel prices expenses for natural gas are higher compared to fuel oil. Switching to natural gas and difficult situation with this fuel in Ukraine forces the enterprise to provide proper conditions for storage of a reserve supply of fuel oil to allow operation of the enterprise under the conditions of absence of natural gas.

1.4. Switching to natural gas over the period following expiry of the crediting period

Switching to natural gas after expiration of the crediting period will also likely be economically unsound. Practicality of implementation of the project after expiry of the crediting period greatly depends on the fuel price difference in Ukraine. For the project to become economically attractive natural gas prices, compared with fuel oil prices shall be reduced greatly, which is nearly impossible.

Step 2. Recall of alternatives not consistent with the current laws and regulations

All alternatives above are consistent with the current laws and respective regulations.

Step 3. Recall of alternatives, for which there are excessive obstacles

Sub-step 3a. Financial barriers

Alternative 1.1 has no considerable financial barriers. The enterprise does not require modernisation and may purchase fuel oil as fuel in the future.

Alternatives 1.2, 1.3 and 1.4 are not financially attractive without a joint implementation project. Implementation of these alternatives requires considerable modernisation of the enterprise and financial investment, which can be attracted only subject to implementation of the JI project.

Sub-step 3b. Technological barriers

Alternative 1.1 has no technological barriers. The enterprise does not require modernisation and may use fuel equipment observing corresponding operating instructions and performing planned repairs.

Alternative 1.2 faces technological barriers associated with use of biofuel for production. Use of large quantities of biomass at large enterprises for satisfaction of production needs is not common practice in Ukraine. There are also no statistical data on availability of the required quantity and quality of biofuel able by its specifications to satisfy production needs of the enterprise in Ukraine. Alternative fuel production and supply schemes are not arranged in Ukraine.

Alternatives 1.3 and 1.4 require modernisation of the enterprise. The main obstacle is no gas supply to the enterprise. To remove technical barriers the enterprise shall construct a gas pipeline allowing use of natural gas as fuel.

Step 4. Comparison of economic attractiveness of the remaining alternatives

It is not required, because only one realistic scenario was determined, i.e. continuation of use of fuel oil as fuel (alternative 1.1.) is the baseline for the proposed joint implementation project.

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

The proposed project is related to the Fuel Combustion category and includes emissions from carbon fossil fuel combustion. Fuel combustion includes fuel oxidation processes for electric power generation for its further direct use or transformation into mechanical power.

Greenhouse gas emissions under the project include CO_2 emissions according to the results of fuel combustion in 4 pipe furnaces of a roast workshop of PFC, LTD. Combustion of fuel oil is performed according to the baseline scenario, and combustion of natural gas is performed according to the project scenario.

Reducing emissions will take place due to replacement of fuel from fuel oil on natural gas. The anthropogenic emissions of greenhouse gases by sources will be reduce in relation to those that would have occurred in the absence of project of general introduction, due to the fact that the oil in relation to natural gas is significantly higher net calorific value and coefficient of emission of $CO2_{equ}$ during combustion. Content of carbon in fuel oil almost on 25%[6] higher than in the natural gas that is why the emissions of greenhouse gases in the atmosphere will be reduced by replacing fuel.

According to the Order of Cabinet of Ministers of Ukraine on 25.12.2002 under the number 723-p[7] had received permission on building of gas pipeline for the gasification of settlements Gayvoronsk, Ulyanovsk regions and Golovanevsk of districts to the Kirovograd area. Providing the population of these areas by natural gas was adopted on the proposal of Kirovograd regional state administration, in consultation with the Ministry of Finance, Ministry of Energy, Ministry of Economy and State Property Fund of Ukraine.

[6] http://www.menr.gov.ua/cgi-bin/go?node=Nac%20kadastr%20parn%20gaz
[7] http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=723-2002-%F0

Additionality of the proposed joint implementation project was assessed in accordance with the methodology ACM0009 "Joint methodology of fuel switching from oil or coal to natural gas" (Version 3.2). According to this methodology, assessment of the principle of additionality comprises 2 stages:
1. Investment analysis;
2. Common practices analysis.

1. Investment analysis.

Comparison of economic attractiveness of the baseline and project scenarios is given below.

1.1. Investment requirements.

Activity under the baseline scenario does not require extra investment for purchase of fuel equipment and, correspondingly, construction and installation of this equipment. The enterprise may continue to use the fuel equipment installed to be fired with fuel oil.

Enterprise modernisation proposed by this project under the project scenario requires investment in the amount of EUR 7562300, including:
- for construction of a gas pipeline, which will allow to switch from fuel oil to natural gas – EUR 7,217,300;
- for replacement of gas burners, which will ensure economic use of natural gas – EUR 345,000.

Realisation of the modernisation above requires considerable investment. The financial condition of the company does not allow implementing the project without attracting investment. The joint implementation project provides the mechanisms allowing attracting financial resources for respective modernisation of the enterprise. The investment required for implementation of the project will be repaid to the investor at the expense of realisation of Emissions Reduction Units generated by this project. Thus only implementation of this joint implementation project will allow generating greenhouse gas emissions reduction.

1.2. Economic efficiency.

Switching from fuel oil to natural gas will not result in increase of production efficiency. Fuel oil in the basic scenario is replaced with an equivalent quantity of natural gas in the project scenario.

Use of natural gas instead of fuel oil will lead to increase of output and to higher quality of products. Thus, the proposed project will not lead to increase of economic efficiency.

1.3. Fuel cost.

In the existing situation in Ukraine switching from fuel oil to natural gas is economically unsound for the enterprise. Ukraine tends to increase natural gas prices annually. Natural gas price growth rates are higher compared with fuel oil. In consideration of current fuel prices[8], the average profit of the enterprise from switching of fuel may be about EUR 0.8 million.

[8] http://mpe.kmu.gov.ua/fuel/control/uk/index

1.4. Fuel supply to the enterprise and other operating expenses.

Fuel oil supply for operation under the baseline scenario is affected by railway transport, and natural gas supply for operation under the project scenario is affected by means of a pipeline gas transmission system.

Cargo transportation by railway transport is the most widely spread and the cheapest means of cargo delivery in Ukraine[9]. Natural gas supply by a gas transmission system of Ukraine is also considerably cheap compared to other means of supply[10].

The difference in expenses for transportation of fuel oil and natural gas in relation to other financial expenses is small, i.e. expenses for transportation of fuel in this project may be neglected.

Switching to natural gas and difficult situation with this fuel in Ukraine forces the enterprise to provide proper conditions for storage of a reserve supply of fuel oil to allow operation of the enterprise in the absence of natural gas, which will require extra investment for purchase and transportation of fuel oil.

Operating expenses, including maintenance of a fuel system are minor compared with other expenses. Expenses for maintenance of a fuel system fired with fuel oil and expenses for maintenance of a fuel system fired with natural gas will be practically equivalent.

1.5. Calculation and comparison of financial indicators.

Financial indicators Net Present Value (NPV) and Internal Rate of Return (IRR) were calculated for two alternatives: with and without use of joint implementation mechanisms. Maintaining a situation with use of fuel oil does not require investment in modernisation and correspondingly will not lead to additional profit or loss of the enterprise, so NPV for this alternative will be equal to 0. Calculation of the financial indicators for an alternative using biofuel is complicated by absence of reliable information on investment required for purchase and installation of equipment, which will allow using biofuel as fuel, and absence of information on the cost of biofuel that would allow satisfying the needs of the enterprise.

Calculation was made using a 10% discount rate, which corresponds to the average credit rate in Ukrainian banks. Financial indicators were calculated for the expected crediting period.

A non-discounted payback period without use of joint implementation mechanisms is 9.5 years, and with their use – 4.25 years.

[9] http://www.uz.gov.ua/?lng=uk
[10] http://www.naftogaz.com/www/2/nakweb.nsf?Open

Calculation of NPV and IRR for two alternatives is given in the table below.

	Without use of joint implementation mechanisms	With use of joint implementation mechanisms
NPV, million EUR	-2.8	5.4
IRR, %	2	20

As is seen from the calculations above, without use of joint implementation mechanisms the project is not attractive for investment, but use of joint implementation mechanisms allows to increase investment attractiveness greatly. Thus one may conclude that the project is additional.

2. Analysis of common practices

The proposed joint implementation project is not common practice. A gas transmission system in the country is not developed well enough to provide natural gas supply to enterprises located far from major cities. PFC, LTD is located in urban settlement Pobugskoye that until implementation of the proposed project was been gasified. Such situation is in most towns and villages of Ukraine. So, the majority of enterprises use fuel oil or coal as fuel for production.

Conclusion: implementation of the project will allow reducing air emission of greenhouse gases, which cannot be achieved in the absence of this project. Any reduction of air emissions achieved within the framework of this joint implementation project will be additional.

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

CO_2, emissions related to fuel combustion in 4 pipe furnaces of a roast workshop of PFC, LTD are included in the project boundary. The project boundary is applied both for the baseline and project scenarios.

To determine the main project emissions, according to ACM0009 "Consolidated methodology for industrial fuel switching from coal or petroleum fuels to natural gas" (Version 3.2) carbon dioxide emission from natural gas combustion is applied to the project. During fuel combustion in pipe furnaces of a roast workshop the basic emission source is CO_2. CH_4 and N_2O emissions are not large-scale, so in accordance with the proposed methodology are not taken into account for calculation of emissions reduction.
To determine the main emissions under the baseline, according to ACM0009 "Consolidated methodology for industrial fuel switching from coal or petroleum fuels to natural gas" (Version 3.2) carbon dioxide emissions from fuel oil combustion are applied to the project in case there is no project activity.

Area boundaries of the project include physical (geographical) location of an emission source. The project boundaries coincide with physical boundaries of PFC, LTD and are related to the region, where the enterprise is located.

The greenhouse gas emission sources are 4 pipe furnaces of a roast workshop, located on the territory of PFC, LTD and are its property.

	Source	Gas	Included?	Justification/Explanation
Baseline	Fuel oil combustion	CO_2	Yes	Main emission source
		CH_4	No	Minor source
		N_2O	No	Minor source
Project Activity	Natural gas combustion	CO_2	Yes	Main emission source
		CH_4	No	Minor source
		N_2O	No	Minor source

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

Baseline was set on: 18/09/2009

The persons setting the baseline are:

Organisation: TEST Centre, LLC
Address: 13a, vulytsia Marshala Tymoshenko, office 611
City: Kyiv
Country: Ukraine
Contact person: Victor Victorovych Kolesnikov
Title: Professional consultant
Phone: +380 44 5692404
Fax: +380 68 1292233
E-mail: vicv@bigmir.net

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

The proposed joint implementation project consists of two stages:
- construction of a gas pipeline connected to the public gas transmission system, which will allow to switch from fuel oil to natural gas;
- installation of modernised gas burners to provide economic use of natural gas.

Completion of construction of a gas pipeline and commencement of work using natural gas – July 12, 2005.
Installation of modernised gas burners – December 11, 2008.

Upon completion of the building of gas pipeline according to the order of Ministry of Fuel and Energy Ukraine from 04.07.2005, № 293 was created the State Commission of the adoption in exploitation of gas pipeline.

As a result of work of the State Commission the company was granted an act of the State Commission from 05.07.2005, "About readiness of a complete construction of the facility for production of the State Commission".

C.2. Expected operational lifetime of the project:

For all proposed measures the operational lifetime is at least 20 years (240 months).

C.3. Length of the crediting period:

15 (fifteen) years and 3 (тthree) months, which is 183 (one hundred eighty three) months.

The crediting period begins on July 12, 2005. Assigned Amount Units (AAU) will be generated during the period from July 12, 2005 to December 31, 2007, which duration is 2 years and 3 months (27 months).

Emission Reduction Units (ERU) are related to the first commitment period under the Kyoto Protocol, which is 5 years (60 months) from January 1, 2008 to December 31, 2012.

If after the first commitment period under the Kyoto Protocol it is prolonged, the credit period under the project may be prolonged up to the end of the expected operational lifetime of the project.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

The object of the monitoring plan chosen for the proposed joint implementation project is to provide availability of all data required for determination of emission levels under the baseline and project scenarios, and correspondingly the emission reduction volume as a result of realisation of the proposed joint implementation project, information about which is given in the sections above.

The monitoring plan applied to this project corresponds to the approved consolidated methodology ACM0009 "Consolidated methodology for industrial fuel switching from coal or petroleum fuels to natural gas" (Version 3.2). This methodology is intended for the projects providing for switching from coal or fuel oil to natural gas in heat generation processes related to production. The proposed project assumes switching from fuel (fuel oil) to natural gas, so fuel is used for combustion in 4 pipe furnaces of a roast workshop of the enterprise for production. Thus, according to the intended purpose of this methodology a monitoring plan for the proposed project was chosen in accordance with the methodology ACM0009 "Consolidated methodology for industrial fuel switching from coal or petroleum fuels to natural gas" (Version 3.2).

According to the order of Ministry of Fuel and Energy of Ukraine from 04.07.2005, № 293 was created the State Commission of the adoption in exploitation of the gas pipeline. As a result of work of the State Commission the company was granted an act of the State Commission from 05.07.2005, "About readiness of a complete construction of the facility for production of the State Commission", that allowed an enterprise to carry out a transition from fuel oil on natural gas.

For monitoring use facilities of measuring technique, which are included in the State register of facilities of measuring technique of Ukraine and which are subject to a periodic check of state.

PFC, LTD has the proper certificate to carry out measurements which are included in the sphere of state supervision.

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

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:								
ID number *(Please use numbers to ease cross-referencing to D.2)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment
1	2	3	4	5	6	7	8	9
1. $FF_{project, NG, y}$	Natural gas volume used	Gas meter, data are entered into the Register	million m^3	m	constantly	1	paper	The data shall be stored during the whole crediting period and within 2 years from the last estimation of ERU
2. NCV_{NG}	Lower combustion temperature of natural gas	National Cadastre of Anthropogenic Emissions and Greenhouse Gas Absorption of Ukraine[11]	TJ/million $м^3$	e	annually	1	paper	the same

[11] http://www.menr.gov.ua/cgi-bin/go?node=Nac%20kadastr%20parn%20gaz

1	2	3	4	5	6	7	8	9
3. $EF_{NG, co2}$	$CO_{2\ equ}$ emission factor for natural gas	National Cadastre of Anthropogenic Emissions and Greenhouse Gas Absorption of Ukraine	t/TJ	e	annually	1	paper	the same

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

Emissions under the project scenario are calculated using the following formula:

$$PE_y = FF_{project, NG, y} \cdot NCV_{NG} \cdot EF_{NG, co2},$$

where:
PE_y – annual emissions under the project scenario, tons of $CO_{2\ equ}$;
$FF_{project, NG, y}$ – annual volume of flared natural gas, million m^3;
NCV_{NG} – lower combustion temperature of natural gas, TJ/million m^3;
$EF_{NG, co2}$ – $CO_{2\ equ}$ emission factor for natural gas, t/TJ.

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:								
ID number *(Please use numbers to ease cross-referencing to D.2)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1	2	3	4	5	6	7	8	9
1. $FF_{project, NG, y}$	Natural gas volume used	Gas meter, data are entered into the Register	million m^3	m	constantly	1	paper	The data shall be stored during the whole crediting period and within 2 years from the last estimation of ERU
2. NCV_{NG}	Lower combustion temperature of natural gas	National Cadastre of Anthropogenic Emissions and Greenhouse Gas Absorption of Ukraine	TJ/million $м^3$	e	annually	1	paper	the same

1	2	3	4	5	6	7	8	9
3. NCV_{BO}	Lower combustion temperature of fuel oil	National Cadastre of Anthropogenic Emissions and Greenhouse Gas Absorption of Ukraine	TJ/thousand tons	e	annually	1	paper	the same
4. ε_{NG}	Energy efficiency of a system fired with natural gas	Measuring	%	c	monthly	1	paper	the same
5. ε_{BO}	Energy efficiency of a system fired with fuel oil	A fixed value on the basis of chorological data was taken for this factor	%	c	fixed	1	paper	the same
6. $EF_{BO, co2}$	$CO_{2\ equ}$ emission factor for fuel oil	National Cadastre of Anthropogenic Emissions and Greenhouse Gas Absorption of Ukraine	t/TJ	e	monthly	1	paper	the same

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

$$BE_y = FF_{baseline, BO, y} \cdot NCV_{BO} \cdot EF_{BO, co2},$$

where:

$$FF_{baseline, BO, y} = FF_{project, NG, y} \cdot \frac{NCV_{NG} \cdot \varepsilon_{NG}}{NCV_{BO} \cdot \varepsilon_{BO}},$$

where:
BE_y – annual baseline emissions, tons of $CO_{2\,equ}$;
$FF_{baseline, BO, y}$ – annual volume of flared fuel oil in case of absence of the project, thousand tons;
NCV_{BO} – lower combustion temperature of fuel oil, TJ/thousand tons;
$EF_{BO, co2}$ – $CO_{2\,equ}$ emission factor for fuel oil, t/TJ;
$FF_{project, NG, y}$ – annual volume of flared natural gas, million m^3;
NCV_{NG} – lower combustion temperature of natural gas, TJ/million m^3;
ε_{NG} – energy efficiency of a system fired with natural gas;
ε_{BO} – energy efficiency of a system fired with fuel oil.

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 applied to this project.

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):

Not applied to this project.

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

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:								
ID number *(Please use numbers to ease cross-referencing to D.2)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment

No leakage is expected. The equipment installed at the enterprise as a result of modernisation of a fuel system including occurrence of natural gas leakage in the process of operation of the fuel system.

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

Not appliquéd to this project.

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):

According to the approved consolidated methodology ACM0009 "Consolidated methodology for industrial fuel switching from coal or petroleum fuels to natural gas" (Version 3.2), annual emissions reduction is calculated by the following formula:

$$ER_y = BE_y – PE_y,$$

where:
ER_y – annual emissions reduction subject to project activity, tons of $CO_{2\,equ}$;
PE_y – annual emissions under the project scenario, tons of $CO_{2\,equ}$;
BE_y – annual emissions under the baseline scenario, tons of $CO_{2\,equ}$.

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:

This project will allow switching fuel for production, namely: to switch fuel oil to natural gas. Greenhouse gas emissions will be reduced as a result of fuel combustion for production at the enterprise owning to the fact that carbon content in fuel oil is much higher than that in natural gas, and lower combustion temperature of fuel oil is higher compared with natural gas. Thus, the general environmental impact of the project is positive. Within the procedures made on request of the respective public services the enterprise regularly reports on environmental performance. The enterprise reports on NOx, SOx and dust emissions. These data will become a part of the monitoring report.

According to the Order of the Ministry of Ecology and Natural Resources of Ukraine of 09.03.2006 No. 108[12], the State Administration of Environmental Resources in Kirovohrad Region grants to the enterprise permit for emissions after substantiation of the contaminant emission volume, prepared in accordance with the instruction approved by this Order. Development of the documents containing substantiation of emission volumes shall be made by the establishments, organisations and institutions entitled to develop such documents and entered into a respective list of the Ministry of Ecology and Natural Resources of Ukraine.

The documents and permits for contaminants emission shall be archived and stored by the principal ecologist of PFC, LTD.

[12] http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=z0341-06

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary
1	2	3
$FF_{project, NG, y}$ (D.1.1.1 – 1, D.1.1.3 – 1)	low	Natural gas consumption volume is determined by means of continuous measuring at the enterprise using a gas meter. Measuring tools used to measure natural gas volume are subject to annual state verification[13]
NCV_{NG} (D.1.1.1 – 2, D.1.1.3 – 2)	low	The value of the lower combustion temperature of natural gas is taken from the National Cadastre of Anthropogenic Emissions and Greenhouse Gas Absorption of Ukraine. The value defined is within the range of uncertainty on default of IPCC values. The National Cadastre is subject to regular revision and correction.
$EF_{NG, co2}$ (D.1.1.1 – 3)	low	The value of $CO_{2\ equ}$ emissions factor for natural gas is taken from the National Cadastre of Anthropogenic Emissions and Greenhouse Gas Absorption of Ukraine. The value defined is within the range of uncertainty on default of IPCC values. The National Cadastre is subject to regular revision and correction
NCV_{BO} (D.1.1.3 – 3)	low	The value of the lower combustion temperature of fuel oil is taken from the National Cadastre of Anthropogenic Emissions and Greenhouse Gas Absorption of Ukraine. The value defined is within the range of uncertainty on default of IPCC values. The National Cadastre is subject to regular revision and correction.
ε_{NG} (D.1.1.3 – 4)	low	Energy efficiency of the system fired with natural gas is defined by way of direct measuring at the enterprise by means of respective measuring tools. The measuring method shall be consistent with state and international standards. Measuring tools used for measurement are subject to regular state verification.

[13] http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=113%2F98-%E2%F0

1	2	3
ε_{BO} (D.1.1.3 – 5)	low	The value of energy efficiency of the system fired with fuel oil is calculated by way of collection of respective data on operation of the system fired with fuel oil. This factor has a fixed value for the whole crediting period
$EF_{BO, co2}$ (D.1.1.3 – 6)	low	$CO_{2\ equ}$ emission factor is taken from the National Cadastre of Anthropogenic Emissions and Greenhouse Gas Absorption of Ukraine. The value defined is within the range of uncertainty on default of IPCC values. The National Cadastre is subject to regular revision and correction.

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

Monitoring of the data defined in the previous section is carried out within general use of the interpose modernisation project regarding fuel switching from fuel oil to natural gas at PFC, LTD. Director General of PFC, LTD appoints personnel of the enterprise, whose obligations include operation and maintenance of a fuel system, and provision of stable and efficient operation of the system. These functions provide, among other things, for registration of all data required for monitoring. The personnel of the enterprise will also be responsible for maintenance of an optimum operating regime. The fuel system performance monitoring group will be headed by Chief Engineer of PFC, LTD. Monitoring will be conducted in close contact with the operating group and will include monitoring itself, as well as analysis and archiving of all data defined in the previous section. Calculation of the emission reduction volume will also be an obligation of the monitoring group. Periodical data on natural gas consumption will be analysed in respect of the respective registered factors provided by the operating group to confirm their consistency. In case of discrepancies between the data their origin may be established in cooperation with the operating group. If any discrepancy is detected in monitoring data, respective adjustment shall be made in the monitoring system of a respective factor or the monitoring system of the fuel system.

All information on the monitoring data and adjustment measures shall be archived for the purpose of verification of the emissions reduction volume in the future. The Chief Engineer is responsible for preparation and archiving of monitoring reports. The Director General regularly analyses the consolidated monitoring data and respective documentation. If required, the joint implementation project developer will provide assistance in organisation of monitoring.

The monitoring and operation control structure is given in Fig. 3.

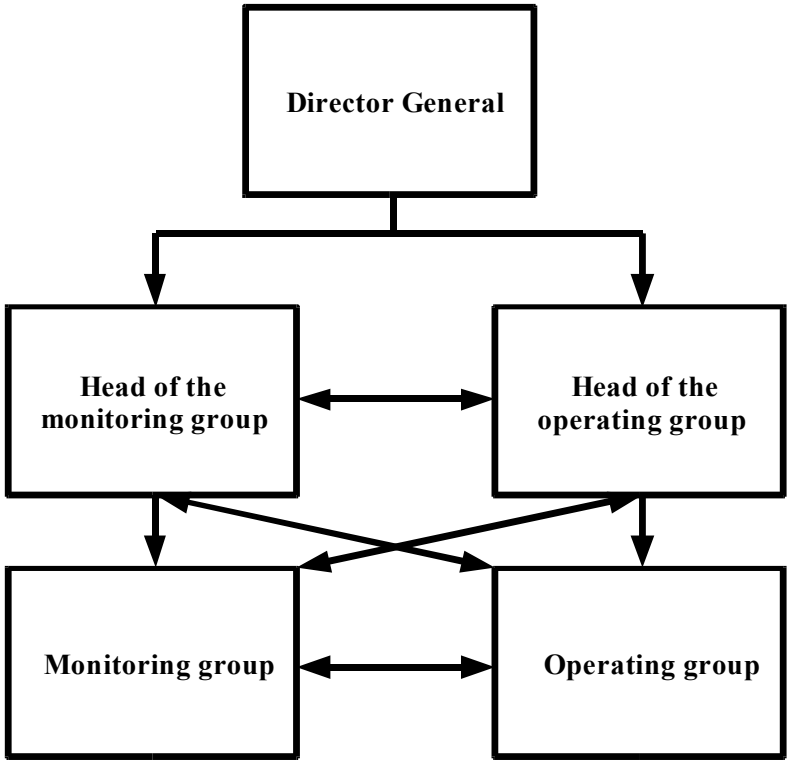

Fig. 3 – Monitoring and operation control structure

Measurement and archiving of measurement results are obligations of the operating group. The measurement results shall be transferred by the operating group to the monitoring group for calculation of greenhouse gas emissions reduction. Obligations of the monitoring group also include collection of data not subject to measurement, but subject to monitoring.

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

The persons establishing the monitoring plan are:

Organisation:	TEST Centre, LLC
Address:	13a, vulytsia Marshala Tymoshenko, office 611
City:	Kyiv
Country:	Ukraine
Contact person:	Victor Victorovych Kolesnikov
Title:	Professional consultant
Phone:	+380 44 5692404
Fax:	+380 68 1292233
E-mail:	vicv@bigmir.net

SECTION E. Estimation of greenhouse gas emissions reduction

E.1. Estimated project emissions:

Project emissions are calculated by the formula given in D.1.1.2.

Year	Estimated project emissions (tonnes of CO_2 equivalent)
2005	38894
2006	160349
2007	141301
2008	153706
2009	150354
2010	153982
2011	153982
2012	153982
2013	153982
2014	153982
2015	153982
2016	153982
2017	153982
2018	153982
2019	153982
2020	153982

E.2. Estimated leakage:

Not applied to this project.

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

The sum of E.1. and E.2. is equal to E.1.

E.4. Estimated baseline emissions:

Baseline emissions are calculated by the formula given in D.1.1.4.

Year	Estimated baseline emissions (tonnes of CO_2 equivalent)
1	2
2005	64091
2006	264232
2007	232843
2008	253284
2009	247761
2010	253739
2011	253739
2012	253739
2013	253739
2014	253739

1	2
2015	253739
2016	253739
2017	253739
2018	253739
2019	253739
2020	253739

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

Year	Estimated emissions reductions (tonnes of CO_2 equivalent)
2005	25197
2006	103883
2007	91542
2008	99578
2009	97407
2010	99757
2011	99757
2012	99757
2013	99757
2014	99757
2015	99757
2016	99757
2017	99757
2018	99757
2019	99757
2020	99757

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

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emissions reductions (tonnes of CO_2 equivalent)
1	2	3	4	5
2005	38894	0	64091	25197
2006	160349	0	264232	103883
2007	141301	0	232843	91542
2008	153706	0	253284	99578
2009	150354	0	247761	97407
2010	153982	0	253739	99757
2011	153982	0	253739	99757
2012	153982	0	253739	99757
2013	153982	0	253739	99757
2014	153982	0	253739	99757
2015	153982	0	253739	99757
2016	153982	0	253739	99757
2017	153982	0	253739	99757

1	2	3	4	5
2018	153982	0	253739	99757
2019	153982	0	253739	99757
2020	153982	0	253739	99757
Total (tonnes of CO_2 equivalent)	2338406	0	3853340	1514934

SECTION F. Environmental impact

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 proposed interference into the existing production scheme has a positive environmental impact owning to switching of PFC, LTD from fuel oil to natural gas and will correspondingly lead to greenhouse gas air emissions reduction.

Emissions reduction will occur as a result of realisation of this project, namely: at the expense of the fact that carbon content in fuel oil is much higher than in natural gas.

Emissions reduction achieved as a result of implementation of this project has environmental impact in Ukraine and does not impact greenhouse gas emissions abroad Ukraine.

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:

Within the framework of this joint implementation project the enterprise constructed a gas pipeline connected to the public gas transmission system in accordance with the current laws of Ukraine. Construction of the gas pipeline allowed the enterprise to switch from fuel oil to natural gas.

Within the procedures made on request of the respective public services the enterprise regularly reports on environmental performance. According to the Order of the Ministry of Ecology and Natural Resources of Ukraine of 09.03.2006 No. 108, the State Administration of Environmental Resources in Kirovohrad Region granted to the enterprise permit for emissions after substantiation of the contaminant emission volume, prepared in accordance with the instruction approved by this Order.

The documents and permits for contaminants emission shall be archived and stored by the principal ecologist of PFC, LTD.

Implementation of the proposed project allowed reducing contaminant air emissions. According to the permits granted by the State Administration of Environmental Resources in Kirovohrad Region, environmental effect is small-scale but positive in general.

For the proposed project an environmental impact assessment (EIA) was completed. Description of environment and estimation of influence on him, according to the EIA, are listed below.

1. Climate and microclimate.

The transition of the fuel system of enterprise from fuel oil on natural gas will entail no considerable additional excretions of heat, moisture, greenhouse gases and other substances, whose emissions can make impact on the climate and microclimate in the area adjacent to the company.

2. Air environment.

To identify the impact of emissions of fuel aggregates on an air pool were made calculations pollutants in the atmosphere. All sources of plant, which throw out NO_x and CO, were taken into account in calculations. According to the calculations maximal concentrations for all substances were below the limits and not render significant environmental impact.

3. Water environment.

The proposed by project activity measures do not lead to contamination or exhaustion of superficial and underground waters. The development of special water protection measures are not needed.

4. Geological environment.

The proposed by project activity measures do not render any negative impact on the geological environment.

5. Soil.

The proposed by project activity measures do not render an impact on the ground and does not change the mechanical, water-physical and other its properties.

6. Flora and Fauna.

The proposed by project activity measures in the whole as an anthropogenic process render on flora and fauna negative impact as a result of noise, air pollution. Impact of emissions in the atmospheric air, based on the size of the boundary concentrations of pollutants on flora and fauna virtually no area is essential and will not lead to depletion or degradation of plant and animal communities as a result of such activities.

Conclusion.

Changing the fuel on an enterprise will significantly reduce emissions of pollutants from the fuel system that will make a positive impact on the population of the area.

SECTION G. Stakeholders' comments

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

The host Party does not require consultations with stakeholders for joint implementation projects.

Stakeholders' comments will be collected in the process of public of this project within the determination procedure.

Annex 1

CONTACT INFORMATION ON THE PROJECT PARTICIPANTS

Organisation:	PFC, LTD (Pobuzhsky Ferronickel Works, Limited Liability Company)
Street/P.O.Box:	Promyslova
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URL:	
Represented by:	
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Salutation:	Mr.
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Annex 2

BASELINE INFORMATION

The proposed project is related to the Fuel Combustion category and includes emissions from carbon fossil fuel combustion. Fuel combustion includes fuel oxidation processes in apparatuses and devices for electric power generation for its further direct use or for transformation into mechanical power.

The main sources of emissions in this category in Ukraine are the Energy sector, Industry and Construction, and Transport, the share of which is nearly 85%[14] of the total emissions in the Fuel Combustion category. Chemical industry is among the biggest industrial fuel consumers in Ukraine after heat energy and iron-and-steel industry. Chemical industry differs by a greater percentage of use of raw fuel.

Because the project activity assumes switching from fuel oil to natural gas for combustion of a respective fuel for production, a large-scale consolidated methodology ACM0009 "Consolidated methodology for industrial fuel switching from coal or petroleum fuels to natural gas" (Version 3.2) was chosen to establish the baseline under this project.

The baseline was assumed to be a situation at the enterprise, when the enterprise uses fuel oil as fuel for production.

The main baseline emissions are CO_2 emissions appearing as a result of combustion of fuel oil in 4 pipe furnaces of a roast workshop for production. CH_4 and N_2O emissions are small-scale, so they were not included into the baseline.

According to the proposed methodology ACM0009 "Consolidated methodology for industrial fuel switching from coal or petroleum fuels to natural gas" (Version 3.2), baseline emissions are calculated by the following formula:

$$BE_y = FF_{baseline,\ BO,\ y} \cdot NCV_{BO} \cdot EF_{BO,\ co2},$$

where:

$$FF_{baseline,\ BO,\ y} = FF_{project,\ NG,\ y} \cdot \frac{NCV_{NG} \cdot \varepsilon_{NG}}{NCV_{BO} \cdot \varepsilon_{BO}},$$

where:
BE_y – annual baseline emissions, tons of $CO_{2\ equ}$;
$FF_{baseline,\ BO,\ y}$ – annual volume of flared fuel oil in case of absence of the project, thousand tons;
NCV_{BO} – lower combustion temperature of fuel oil, TJ/thousand tons;
$EF_{BO,\ co2}$ – $CO_{2\ equ}$ emission factor for fuel oil, t/TJ;
$FF_{project,\ NG,\ y}$ – annual volume of flared natural gas, million m^3;
NCV_{NG} – lower combustion temperature of natural gas, TJ/million m^3;
ε_{NG} – energy efficiency of a system fired with natural gas;
ε_{BO} – energy efficiency of a system fired with fuel oil.

[14] http://www.menr.gov.ua/cgi-bin/go?node=Nac%20kadastr%20parn%20gaz

The annual volume of flared natural gas was determined using the forecasted consumption volume of natural gas required for production for the crediting period.

For the lower combustion temperature of fuel oil and the lower combustion temperature of natural gas the following values were chosen, as defined in the National Cadastre of Anthropogenic Emissions and Greenhouse Gas Absorption of Ukraine.

$CO_{2\ екв}$ emission factor was calculated in accordance with the method provided in the National Cadastre of Anthropogenic Emissions and Greenhouse Gas Absorption of Ukraine. According to this method, the emission factor was calculated by the following formula:

$$EF_{BO,\ co2} = k_{BO,\ c} \cdot k_{BO,\ o} \cdot 44/12,$$

where:

$EF_{BO,\ co2}$ – $CO_{2\ equ}$ emission factor for fuel oil, t/TJ;
$k_{BO,\ c}$ – carbon content in fuel, t/TJ;
$k_{BO,\ o}$ – carbon oxidation factor;
44/12 – stoichiometric ratio between the molecular weight of carbon dioxide and carbon.

Energy efficiency of a system fired with fuel oil was determined using the value consistent with ACM0009 "Consolidated methodology for industrial fuel switching from coal or petroleum fuels to natural gas" (Version 3.2). The value of energy efficiency of a system fired with fuel oil was taken as an average value between the values for an old fuel system fired with liquid fuel and an old system fuel system fired with coal.

Energy efficiency of a system fired with natural gas was determined using the expected value of energy efficiency after taking all measures proposed by this project. The new fuel system is expected to provide the maximum energy efficiency.

Uncertainty emission estimate in Ukraine in the Fuel Combustion category depends on uncertainty of data on activity and emission factors.

Uncertainty of the data on activity in this category is explained by:
- an instrumental error in measurement of a fuel consumption rate (this error is determined by accuracy of measuring tools for determination of a fuel consumption rate. Error of these measuring tools is regulated by the state standards system);
- an instrumental error in measurement of the lower combustion temperature of fuel (this error is determined by accuracy of calorimeters, which is regulated by state standards);
- uncertainty of samples taken for calorimetric analysis (the sampling procedure is defined by specialised documents and corresponds to the rules of random sampling, but the quantitative estimate of uncertainty arising in this case is unknown);
- accuracy of measuring of reference values of the percentage of carbon in solid fuel;
- accuracy of measurements to determine the factor of attribution of combustibles to fuel (carbon loss and incomplete combustion);

The estimated total uncertainty of the value of greenhouse gas emissions in this category in Ukraine in 4.0%[15].

The degree of uncertainty of data is given in Table D.2 of this project.

Design data given in tables below.

<table>
<tr><td>Data/Parameter</td><td>$FF_{project, NG, y}$</td></tr>
<tr><td>Data unit</td><td>million m^3</td></tr>
<tr><td>Description</td><td>Amount of natural gas which is consumed</td></tr>
<tr><td>Time off determination/monitoring</td><td>Permanent measurement. Information must be kept during all period of crediting and during 2 years after the last calculation of ERUs</td></tr>
<tr><td>Source of data (to be) used</td><td>Measurement</td></tr>
<tr><td>Value of data applied
(for ex ante calculations/determinations)</td><td>The expected consumption of natural gas, calculated on the basis of the forecast information about the production of goods by an enterprise
<table>
<tr><td>Year</td><td>million m^3</td></tr>
<tr><td>2005</td><td>20,584</td></tr>
<tr><td>2006</td><td>84,863</td></tr>
<tr><td>2007</td><td>74,782</td></tr>
<tr><td>2008</td><td>81,347</td></tr>
<tr><td>2009</td><td>79,573</td></tr>
<tr><td>2010</td><td>81,493</td></tr>
<tr><td>2011</td><td>81,493</td></tr>
<tr><td>2012</td><td>81,493</td></tr>
<tr><td>2013</td><td>81,493</td></tr>
<tr><td>2014</td><td>81,493</td></tr>
<tr><td>2015</td><td>81,493</td></tr>
<tr><td>2016</td><td>81,493</td></tr>
<tr><td>2017</td><td>81,493</td></tr>
<tr><td>2018</td><td>81,493</td></tr>
<tr><td>2019</td><td>81,493</td></tr>
<tr><td>2020</td><td>81,493</td></tr>
</table></td></tr>
<tr><td>Justification of the choice of data or description of measurement methods and procedures (to be) applied</td><td>Measurement of consumption of natural gas is carried out by the meters of gas. An enterprise has a certificate on a right for implementation of measurements which are included in the sphere of state supervision.</td></tr>
<tr><td>QA/QC procedures (to be) applied</td><td>Gas meters are subject to state periodic check</td></tr>
<tr><td>Any comment</td><td>-</td></tr>
</table>

[15] http://www.menr.gov.ua/cgi-bin/go?node=Nac%20kadastr%20parn%20gaz

Data/Parameter	NCV_{NG}
Data unit	TJ/million m^3
Description	Net calorific value of natural gas
Time off determination/monitoring	Annually. Data must be stored during the entire loan and another for 2 years after the last calculation of ERUs
Source of data (to be) used	"National Cadastre of Anthropogenic Emissions and Greenhouse Gas Absorption of Ukraine"
Value of data applied (for ex ante calculations/determinations)	33,85
Justification of the choice of data or description of measurement methods and procedures (to be) applied	"National Cadastre of Anthropogenic Emissions and Greenhouse Gas Absorption of Ukraine" subject to periodic review and making it relevant correction data
QA/QC procedures (to be) applied	A certain parameter is within the limits of range of uncertainty for the default values IPCC
Any comment	-

Data/Parameter	$EF_{NG, co2}$
Data unit	tonnes of CO_2 equivalent/TJ
Description	Emission factor $CO_{2\,equ}$ for natural gas
Time off determination/monitoring	Monthly. Data must be stored during the entire loan and another for 2 years after the last calculation of ERUs
Source of data (to be) used	"National Cadastre of Anthropogenic Emissions and Greenhouse Gas Absorption of Ukraine"
Value of data applied (for ex ante calculations/determinations)	55,82
Justification of the choice of data or description of measurement methods and procedures (to be) applied	"National Cadastre of Anthropogenic Emissions and Greenhouse Gas Absorption of Ukraine" subject to periodic review and making it relevant correction data
QA/QC procedures (to be) applied	A certain parameter is within the limits of range of uncertainty for the default values IPCC
Any comment	-

Data/Parameter	NCV_{BO}
Data unit	TJ/thousand tons
Description	Net calorific value of fuel oil
Time off determination/monitoring	Annually. Data must be stored during the entire loan and another for 2 years after the last calculation of ERUs
Source of data (to be) used	"National Cadastre of Anthropogenic Emissions and Greenhouse Gas Absorption of Ukraine"
Value of data applied (for ex ante calculations/determinations)	40,5
Justification of the choice of data or description of measurement methods and procedures (to be) applied	"National Cadastre of Anthropogenic Emissions and Greenhouse Gas Absorption of Ukraine" subject to periodic review and making it relevant correction data
QA/QC procedures (to be) applied	A certain parameter is within the limits of range of uncertainty for the default values IPCC
Any comment	-

Data/Parameter	ε_{NG}
Data unit	%
Description	Energy efficiency of the system on natural gas
Time off determination/monitoring	Permanent measurement.Data must be stored during the entire loan and another for 2 years after the last calculation of ERUs
Source of data (to be) used	Measurement
Value of data applied (for ex ante calculations/determinations)	73,5
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculation of energy by using the appropriate measuring equipment. An enterprise has a certificate to carry out measurements which are included in the sphere of state supervision
QA/QC procedures (to be) applied	Measuring devices used in the measurements are subject to state periodic check
Any comment	-

Data/Parameter	ε_{BO}
Data unit	%
Description	Energy efficiency of the system on fuel oil
Time off determination/monitoring	Fixed information. Data must be stored during the entire loan and another for 2 years after the last calculation of ERUs
Source of data (to be) used	For this parameter was taken a fixed value based on chronological data about work on the fuel system on fuel oil
Value of data applied (for ex ante calculations/determinations)	61,2
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Fixed information
QA/QC procedures (to be) applied	This factor has a fixed value for the all crediting period
Any comment	-

Data/Parameter	$EF_{BO, co2}$
Data unit	tonnes of CO_2 equivalent/TJ
Description	Emission factor $CO_{2\ equ}$ for fuel oil
Time off determination/monitoring	Monthly. Data must be stored during the entire loan and another for 2 years after the last calculation of ERUs
Source of data (to be) used	"National Cadastre of Anthropogenic Emissions and Greenhouse Gas Absorption of Ukraine"
Value of data applied (for ex ante calculations/determinations)	76,59
Justification of the choice of data or description of measurement methods and procedures (to be) applied	"National Cadastre of Anthropogenic Emissions and Greenhouse Gas Absorption of Ukraine" subject to periodic review and making it relevant correction data
QA/QC procedures (to be) applied	A certain parameter is within the limits of range of uncertainty for the default values IPCC
Any comment	-

Annex 3

MONITORING PLAN

Because the project activity assumes switching from fuel oil to natural gas for combustion of a respective fuel for production, a large-scale consolidated methodology ACM0009 "Consolidated methodology for industrial fuel switching from coal or petroleum fuels to natural gas" (Version 3.2) was chosen to establish the baseline and determine the monitoring plan.

The monitoring plan is determined in section D of this project.