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

CONTENTS

SECTION A. General description of the project

A.1. Title of the project:

"Implementation of energy saving measures at PJSC "Ingulets iron ore enrichment works"

Sector: (8) Mining/mineral production

Version of the document: 2.0

Date of the document: November 16, 2012

A.2. Description of the project:

Implementation of energy saving measures at PJSC "Ingulets iron ore enrichment works" is a project that is aimed at reduction of greenhouse gas (GHG) emissions by reducing electricity consumption at the site and envisages implementation of a number of complex measures while maintaining iron ore concentrate production at the same level.

PJSC "Ingulets iron ore enrichment works" (or PJSC "Ingulets GOK") specializes in the mining and processing of banded iron formation of Ingulets deposit, located in the southern part of the Kryvyi Rih iron ore basin. The company applies the conveyor ore mining transportation technology using the auto-conveyor transport. Among consumers of the company are the largest metallurgical enterprises of Ukraine, namely: JSC "Zaporizhstal", JSC "Ilyich Iron and Steel Works of Mariupol", JSC "Dniprovskyi Integrated Iron and Steel Works named after F. Dzerzhinsky", JSC "Azovstal". The foreign market consumers are Eastern Europe and China iron and steel works.

Situation before project implementation

In the process of iron ore mining and its enrichment to produce iron-ore concentrate PJSC "Ingulets iron ore enrichment works" uses a great number of industrial electrical equipment with different capacity. Unfortunately, due to obsolescence and partial depreciation of equipment, as well as low-level optimization of business processes, the efficiency of electricity consumption at the enterprise is low. The company has a significant potential to implement energy efficiency measures, though their realization requires considerable financial investment.

Baseline scenario

Baseline scenario was chosen as a continuation of the existing practice the enterprise uses: in the baseline scenario, the company uses existing equipment for production, while performing only routine repairs. The company is not introducing new equipment due to the lack of funds and investment barriers of such an activity (the justification is provided in Section B.2.). Although existing equipment consumes a large amount of electricity, it is properly operating and does not require significant investment that satisfies the enterprise.

Project scenario

When the company discovered the benefits that the joint implementation mechanism offers, it was decided to implement measures aimed at the reduction of greenhouse gases into the atmosphere. The company decided to implement a comprehensive energy efficiency program, which will lead to a significant reduction of electric energy consumption and, thus reduce emissions of greenhouse gases into the atmosphere.

Project provides the following activities that lead to the desirable effect:

- Modernization, replacement, optimization and adjusting the operation mode of pumping equipment and units;
- Modernization, replacement, optimization and adjusting the operation mode of the compressor equipment and units;

- Modernization, replacement, optimization and adjusting the operation mode of the electric motors;
- Installation of saving high pressure hydraulic dredge pumps;
- Upgrading equipment for the ore blending;
- Modernization and operation mode optimization of underloaded transformer equipment;
- Replacing lighting to more energy efficient types;
- Construction and commissioning of the gravity discharge bypass of the pumping station to supply service water;
- Installation of frequency converters for pump equipment and electric motors.

Emission reductions resulting from this project will come from the following sources:

- Reduction of greenhouse gas emissions from electricity production in the United Energy System of Ukraine, due to reduction of energy consumption for production needs.

Project history including JI components

Joint Implementation Mechanism played a key role in the realization of this project. Taking into account the future return of generated emission reduction units sale, in early 2005 the company decided to implement complex energy saving project. To achieve the project objectives, in 2005 the development of design decisions on energy saving measures was initiated. Construction and measures implementation has been taking place continuously during 2006-2011; the company is still planning to continue energy efficiency program. Average annual reduction of carbon dioxide emissions into the atmosphere as a result of the project realization is approximately 77 011 tons of CO_2 equivalent for 2008-2012. Total amount of emissions reduction period is 385 053 tons of CO_2 equivalent in 2008-2012.

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)	• PJSC "Ingulets iron ore enrichment works"	No
The Netherlands	• Metinvest International SA	No

Table 1 Data on the Parties involved into JI project

PJSC "Ingulets iron ore enrichment works" is the owner and developer of the project. The company specializes in the mining and processing of banded iron formation of Ingulets deposit, located in the southern part of the Kryvyi Rih iron ore basin.

Metinvest International SA is a potential buyer of ERUs under the project. Metinvest International SA is a part of Metinvest Group. Metinvest International SA is a trading company established in 1997 and with head-quarter in Switzerland specializing in steel and iron ore marketing. The core activity of company is aimed at marketing of iron ore, half-finished and finished steel products produced by mining and metallurgical enterprises of Metinvest Group.

A.4. Technical description of the project:

A.4.1. Location of the project:

A.4.1.1. Host Party(ies):

Ukraine

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

Dnipropetrovsk Region

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

Kryvyi Rih

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

Figure 1 Location of Kryvyi Rih and satellite image of PJSC "InGOK" site (Source: Google Maps)[1]

PJSC "Ingulets iron ore enrichment works" is located in Kryvyi Rih.

Kryvyi Rih is a city of regional subordination in the Dnipropetrovsk Region of Ukraine, and is the largest city of Ukraine, which is not the regional center, with population as of 01.07.2012 amounted to 660 714 people. The city is the large industrial and cultural center of Ukraine, and is the center of Kryvyi Rih metropolitan area. It is located in the southwest of Dnipropetrovsk Region. The distance to the capital of Ukraine – Kyiv – is 346 km, and to the regional center – Dnipropetrovsk – 137 km. The city was founded by ataman Petro Kalnyshevsky in 1775. Since the late nineteenth century the city becomes the

1 https://maps.google.com.ua/maps?q=47%C2%B039%E2%80%B225.47%E2%80%B3+N,+33%C2%B012%E2%80%B202.80%E2%80%B3+E&hl=uk&ie=UTF8&sll=48.382803,31.17461&sspn=9.7348,26.784668&t=h&z=13

center for the exploration and development of iron ore, begins development of metallurgy and industry. Modern Kryvyi Rih is a big industrial city, the center of Kryvyi Rih iron ore basin – the most important resource base of the Ukrainian metallurgy.

Geographical coordinates of the site of the project location:

47°39′25,47″ N 33°12′02,80″ E

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

The project envisages the implementation of measures that lead to the reduction of the specific electric energy consumption for production of iron ore concentrate at PJSC "Ingulets iron ore enrichment works".

The key measures that are to be implemented under the JI project are provided below.

Construction and commissioning of the gravity supply pipeline bypassing the pump station to supply service water:

Prior to the project implementation the service water was fed to the ore-dressing plants ## 1 and 2 (ODP ## 1, 2) from the intake ponds through the pump station equipped with 13 powerful stationary pumping units with a capacity of 500-1600 kW. Although intake ponds were located above the level of water consumers settlements (intake ponds # 5, for instance, is at around 133.5 m above sea level, intake pond # 4 – around +128.4 m above sea level, when the consumers – ODP ## 1, 2 – around 90 and 92 m respectively), the existing water supply system didn't allow the use of water-level difference for its transmission, therefore all water pumping is fully performed by the pump station.

Figure 2 Gravity service water supply pipelines at PJSC "InGOK"

The project envisages the construction of gravity supply pipeline for use of the potential hydroelectric power with its further feeding the production process. Water supply pipelines do not consume electricity for supplying water to consumers, but they use the difference in water level to build up the water pressure. The construction of gravity water supply system took place during 2010-2011. During the project realization two lines of gravity supply pipeline were built, where each line consists of three steel pipe length of 1500 m and a diameter of 600 mm. Two stationary pumps with a total capacity of 2.6 MW were shutdown to cold reserve.

As a result, major amount of water is fed to ODP ## 1, 2 through gravity water pipelines, thus reducing the load and electricity consumption by the pump station.

Installation of frequency converters for pump equipment and electric motors:

The plant pumps and electric motors have been equipped with frequency converters under the project realization.

Frequency converters are designed serve for smooth regulation of asynchronous motor speed by use of transforming frequency of the current. The regulation of voltage and frequency is performed either according to V/F characteristic or by use of vector type regulation. Frequency converters consist of rectifier (direct-current bridge) converting alternating current into direct one and of inverter performing back-conversion of the direct current (DC) into the alternative one (AC) of specified frequency and amplitude. For improvement of the output voltage shape, the restrictor is installed between a motor and a converter.

The project commissioned the following frequency convertors:

- At the pump number 103 (model GR 400/40 with a capacity of 160 kW) – 2011;
- At the pump number 51 (model LCC M 300 710.3 with a capacity of 630 kW) – 2011;
- At the pump number 81 (model LCC R 200 610.3 with a capacity of 630 kW) – 2011;
- At the electric motor AYRM132M4 with a capacity of 11 kW – 2011.

Frequency converters EKT4D1 for pumps and EKT4D2M for electric motors ensure regulated power transmission to the motor that can effectively reduce the performance and save electric energy. Thus, it is expected that the upgraded equipment will operate at maximum efficiency, hence a large amount of electricity will be saved.

Replacing lighting to more energy efficient types:

The plant is occupying large area thereafter the plant's territories and premises have to be illuminated in order to ensure the working process and meet manufacturing standards for the occupational safety and health.

Before the project implementation the company has used spotlights ISU 500 working on incandescent lamps. The project provides for the replacement of existing inefficient lighting with new that will give significant saving effect. In 2009 within the project activity, spotlights ISU 500 were replaced by two spotlights KTU-01-2000-2 using gas-discharge lamps. The lamps of KTU series have the highest rate of energy efficiency (the ratio of luminous flux to power). Their powerful white light provides high quality lighting.

	Unit	ISU 500	KTU -01-2000-2
Installed capacity	kW	500	2000
Nominal voltage	V	230	380
Current	-	alternative	alternative
Type of lamp	-	Halogen incandescent lamp	Gas-discharge lamp
Dimensions	mm×mm×mm	185×255×135	560×350×520

Table 2 Specifications of lighting units ISU 500 and KTU-01-2000-2

After installing the new energy-efficient spotlights at PJSC "Ingulets iron ore enrichment works" plant's lighting system runs more efficiently, which allows to save electric energy and reduce greenhouse gas emissions into the atmosphere.

Modernization and optimization of underloaded transformer equipment:

The iron ore enrichment works operates a large amount of electrical equipment of different capacity and voltage. Converting of alternative current voltage to the required value is taking place at the transformer substations through the transformers. The most important characteristics of transformers are the transformer ratio and power. They determine the value of the output voltage and power of consumers, which this transformer can serve.

Using of transformers results in electric power losses. The main reasons of electric power losses when the transformer is in operation are: non-optimal transformer loading, conductor heating due to the winding resistance and the phenomenon of "skin effect", i.e. the penetration of the electromagnetic field into the conductor at a certain depth, which increases the resistance and reduces the cross-sectional area of the conductor through which current flows. PJSC "Ingulets iron ore enrichment works" transformer substations have a surplus of installed capacity through the transformer load is not optimal, and the average rate of loading is low.

The project activity involves reduction of electric power losses at transformer substations. Significant energy saving in transformers can be obtained by establishing a viable and optimal mode of their operation. The objective of this optimization is that depending on the total load, operating capability and number of simultaneously operating transformers that is necessary for the effective load distribution and thus the minimal level of energy losses in transformers.

In 2009 the works aimed at the reduction of losses in transformers were carried out within the project activity. Underloaded transformers were placed in reserve and load distribution was performed.

Upgrading equipment for the ore sorting:

Iron ore sorting is one of the main processes at the plant. Iron ore sorting increases the consistency of chemical composition and physical properties of the ore and is a necessary step in the process of iron ore concentrate generation.

The key equipment involved in the process of iron ore sorting at ore dressing plant is vibratory feeders PT-196 with an electromagnetic drive. They are designed to operate at ore-dressing plants and at ore sorting complexes. The main function of vibratory feeder is accumulation of ore materials in the hopper and their delivery to the production line in cyclic mode. Production capacity of feeders PT-196 is up to 300 tons of material per hour.

Upgrading the ore sorting technology by modernization the vibration feeders PT-196 was carried out within the project in 2007. As part of the modernization, a number of measures have been implemented, including the avoidance of short circuits at equipment body by upgrading the coils and changing the number of vibration feeder turns. All worn and broken parts were also replaced, and the old engine was replaced with a new one. Following the upgrading feeder production capacity significantly increased, allowing further reduction of electric power consumption.

Implementation of economic high-pressure dredgers:

Shop of service water and slurry pumping installations (TsTVShH) of JSC "Ingulets iron ore enrichment works" ensures the process of ore enrichment with service water: hydraulic transportation and tailings storage. The shop is operates slurry pump stations (SPS) equipped with dredgers «Uralhidromash" (Russia) 2HRT 8000/71.

Dredge pumps 2HRT 8000/71 are designed for pumping gravel, sand and gravel, slag and other abrasives hydromixes with density of 1300 kg/m^3.

	Unit	Value
Efficiency	m^3/h	8000
Pressure	bar	**7**
Capacity	kW	3150
Dimensions	mm×mm×mm	2890x3445x3340
Weight	kg	29900

Table 3 Specifications of dredgers 2HRT 8000/71

Figure 3 Dredging system HHD-49

In 2007-2011 six high-pressure dredgers: 5 HHD-49 and 1 HHD-76 produced by Sheekar Corporation USA were introduced in plant's TsTVShH. Thus, the entire pumping system of TsTVShH was modernized, and the old units 2HRT 8000/71 were replaced with a modern effective dredgers. Replacing of every outdated pump to the new high-pressure dredgers allows increasing productivity from 8000 to 10000 m^3, and significantly reducing electric power consumption at the plant by reducing specific energy consumption per m^3 of pumpage.

	Од. вимір.	Значення
Productivity	m^3/h	14 700
Pressure	bar	20
Ambient temperature	ºC	120

Table 4 Peak characteristics of dredgers HHD

Modernization, replacement, optimization and fine-tuning of the motors, pumps and compressor equipment:

Replacing of old equipment with new, its modernization, optimization and selection of the correct modes makes it possible to significantly reduce power consumption by the plant.

The project commissioned the following interventions of this type:

- Excluding the pump unit HR 160/31.5 with a motor capacity of 55 kW out of the process flowchart – 2007;
- Transfer of the pumps 8HRK 400/40 on the belt transmission – 2007;
- Implementation of compressed air supply to the SCC-1 by compressor VP-50 – 2008;
- Conveyor 1. Replacement of two driving electric power motors with P = 800 kW for two motors P = 500 kW – 2008;
- Disabling 4-machine unit excavators on the technological break – 2008;

- Replacement of GR 400/40 pumps with the GR 160/31.5 – 2008;
- Stopping exhauster of the bunker-top station when stopping conveyor O-3 – 2008;
- Changing two electric power motors P = 800 kW for two electric power motors P = 500 kW – 2009;
- Installation of temperature regulators RT01-02 on the space heaters on drilling station – in 2010;
- Replacement of the motor pump for service water number 4 P = 250 kW with motor P = 37 kW – 2010;
- Changing schedule of the pumping station for the return of seepage water. Excluding work during peak times – in 2011;
- Changing schedule of the dredging number 3. Excluding work during peak times – in 2011.

Activities implemented under the project reflect good industrial practice and current recommendations, namely: installed equipment and implemented technologies provide significant reduction of energy consumption, give greater effect compared to the equipment that is widely used in Ukraine. It is unlikely that any other will replace equipment put into service in the near future, because it is workable and gives a significant effect of energy conservation.

In addition to reducing greenhouse gas emissions and decreasing of energy consumption, the project will significantly improve the environmental situation in the company and the city in general.

The history of project implementation is provided above. General JI project implementation schedule at the plant is presented in the table below:

Scheduled starting date of the project. Start of emission reduction units generation.	01/01/2007
Current situation	Project is implemented and improved continuously
Project lifetime	14 years – from 01/01/2007 to 31/12/2020

Table 5 Implementation schedule

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:

Main activity of PJSC "Ingulets iron ore enrichment works" is the production of high-quality iron ore concentrate. The company applies the conveyor ore mining transportation technology using the auto-conveyor transport.

Most of the plant's production equipment, except carriage rolling stock used to transport materials and products, is electrical and consumes electric power from the United Energy Systems of Ukraine. The company is an electricity consumer of the first class according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052.

Because most of the electrical equipment of PJSC "Ingulets iron ore enrichment works" is outdated and partially worn, production process at the plant is accompanied by high electricity consumption.

In the baseline scenario, due to the constant lack of funds and difficult investment climate in Ukraine, the use of existing equipment is a common practice at the company.

Within the project activity, the enterprise, taking into account the possible benefits from the development of joint implementation project, made a decision to implement a complex program aimed at significant energy savings. Reducing greenhouse gas emissions will be achieved by reducing the electricity consumption from the network.

Taking into account national sectoral circumstances and financial barriers for the project, the project activity would not have been realized in the absence of Joint Implementation Initiative (for more detail see Section B.2.).

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

	Years
Length of the crediting period:	1
Year	Estimate of annual emission reductions in tons of CO_2 equivalent
Year 2007	58 280
Total estimated emission reductions over the crediting period (tons of CO_2 equivalent)	58 280
Annual average of estimated emission reductions over the crediting period (tons of CO_2 equivalent)	58 280

Table 6 Estimated amount of emission reductions in 2007

	Years
Length of the crediting period:	5
Year	Estimate of annual emission reductions in tons of CO_2 equivalent
Year 2008	153 230
Year 2009	1 034
Year 2010	102 865
Year 2011	63 962
Year 2012	63 962
Total estimated emission reductions over the crediting period (tons of CO_2 equivalent)	385 053
Annual average of estimated emission reductions over the crediting period (tons of CO_2 equivalent)	77 011

Table 7 Estimated amount of emission reductions for 2008-2012

	Years
Length of the crediting period:	8
Year	Estimate of annual emission reductions in tons of CO_2 equivalent
Year 2013	63 962
Year 2014	63 962
Year 2015	63 962
Year 2016	63 962
Year 2017	63 962
Year 2018	63 962
Year 2019	63 962
Year 2020	63 962
Total estimated emission reductions over the crediting period (tons of CO_2 equivalent)	511 696
Annual average of estimated emission reductions over the crediting period (tons of CO_2 equivalent)	63 962

Table 8 Estimated amount of emission reductions for 2013-2020

A.5. Project approval by the Parties involved:

The Letter of Endorsement from the State Environmental Investment Agency of Ukraine # 3486/23/7 was obtained on 15/11/2012. According to the Law of The Netherlands, obtaining of the Letter of Endorsement is not required.

Once accredited independent entity (AIE) completes the determination report, the PDD and determination report will be submitted to the State Environmental Investment Agency of Ukraine in order to obtain a Letter of Approval from Ukraine. Letter of Approval from The Netherlands will be received after the publication of the PDD on www.ji.unfccc.int.

SECTION B. Baseline

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

A baseline for the JI project is set in accordance with Appendix B to decision 9/CMP.1[2] (JI guidelines), and with further guidance on baseline setting and monitoring developed by the Joint Implementation Supervisory Committee (JISC). In accordance with the Guidance on Criteria for Baseline Setting and Monitoring (version 03)[3] (hereinafter referred to as Guidance), the baseline for a JI project is the scenario that reasonably represents the anthropogenic emissions by sources or anthropogenic removals by sinks of GHGs that would **occur in the absence of the proposed project**. In accordance with the Paragraph 9 of the Guidance the project participants may select: an approach for baseline setting and monitoring developed in accordance with appendix B of the JI guidelines (JI specific approach); or a methodology for baseline setting and monitoring approved by the Executive Board of the clean development mechanism (CDM), including methodologies for small-scale project activities, as appropriate, in accordance with paragraph 4(a) of decision 10/CMP.1, as well as methodologies for afforestation/reforestation project activities. Paragraph 11 of the Guidance allows project participants that select a JI specific approach to use selected elements or combinations of approved CDM baseline and monitoring methodologies or approved CDM methodological tools, as appropriate.

Description and justification of the baseline chosen is provided below in accordance with the "Guidelines for users of the Joint Implementation Project Design Document Form" (version 04)[4], using the following step-wise approach:

Step 1. Indication and description of the approach chosen regarding baseline setting

Project participants have chosen the following approach regarding baseline setting, defined in the Guidance (Paragraph 9 (*a*)):

- An approach for baseline setting and monitoring developed in accordance with appendix B of the JI guidelines (JI specific approach).

The Guidance applied to this project: the approach mentioned above was chosen in accordance with Paragraph 9 of the Guidelines. The detailed theoretical description of the baseline in a complete and transparent manner, as well as a justification in accordance with Paragraph 23 through 29 of the Guidance is provided by the project participants.

The baseline for this project shall be established in accordance with appendix B of the JI guidelines and Guidance on Criteria for Baseline Setting and Monitoring. Furthermore, the baseline shall be identified by listing and describing plausible future scenarios on the basis of conservative assumptions and selecting the most plausible one.

The most plausible future scenario will be identified by performing a barrier analysis. Should only two alternatives remain, of which one alternative should represent the project scenario with the JI incentive, the most recent version of the CDM Tool "Tool for the demonstration and assessment of additionality" shall be used to prove that the project scenario cannot be regarded at the most plausible one, as it is stated in Paragraph 44(c) of the Annex 1 to the "Guidance on criteria for baseline setting and monitoring", version 03. While developing of this PDD, the latest version of the "Tool for the demonstration and assessment of additionality" approved by the CDM Executive Board, was 06.0.0[5], thus it was used to demonstrate the project activity additionality.

[2] http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf№ page=2

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

[4] http://ji.unfccc.int/Ref/Documents/Guidelines.pdf

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

Step 2. Application of the approach chosen

Plausible future scenarios shall be identified in order to establish a baseline.

Key factors influencing the possible baseline were taken into account:

1) **Sectoral reform policies and legislation.** At the time of project development, the State program of industry development for 2003-2011[6] was taken into account. This Program foresees three stages of development:
   a) During the first preparatory phase (2003), the conditions aimed at increase of government's efforts to develop industry are assumed to be created, namely: focusing state efforts on the development of industry and the development of an enabling legal environment for future development and reform of the tax sector;
   b) The second phase (2003-2006) envisages further development the first phase to transform industrial sector into a powerful system on the basis of self-renewal and sustainable accelerated growth;
   c) During the third phase (2006-2011) new high technologies with improved technical and economic performance, reduced energy and resource-intensiveness production of integrated automation and computerization of production processes and the implementation of other effective changes in the industry were widely introduced.

   However, it is supposed that enterprises finance these improvements from their own funds or bank loans, which practically means that Ukrainian government is not intervening in this process and execution of the Program fully depends on market conditions and availability of financial resources. In case of existence of any incitements in accordance with this program, they could alleviate the barriers, which prevent the proposed project realization. Nevertheless, no definite mechanisms for stimulation were developed. Therefore, plants in Ukraine have no obligations to implement any energy efficient measures. Taking into account the above mentioned it is reckoned that no policies and legislation can influence the baseline;

2) **Economic situation/growth and socio-demographic factors in the relevant sector as well as resulting predicted demand.** Among consumers of the company are the largest metallurgical enterprises of Ukraine, namely: JSC "Zaporizhstal", JSC "Ilyich Iron and Steel Works of Mariupol", JSC "Dniprovskyi Integrated Iron and Steel Works named after F. Dzerzhinsky", JSC "Azovstal". The foreign market consumers are Eastern Europe and China iron and steel works. Plant's production output of iron ore concentrate depends on the level of demand from the main consumers, which in turn depends on the trends of the world market of steel products. It is assumed that the project would not affect the level of production of goods and the demand for them; production capacity was not increased under the project. The main factors of influence are the economic situation in the world and the decisions of the company.
   Thereby, suppressed and/or increased demand that will be met by the project can be considered in the baseline as appropriate (e.g. by assuming that the same level of service as in the project scenario would be offered in the baseline scenario).

3) **Availability of capital (including investment barriers).** Ukraine has been always considered a high-risk country for investments and doing business. Table below summarizes key indicators of business practices in Ukraine.

Indicators	2006	2007	2008	2009	Note
Corruption index of Transparency International	99 position from 163	118 position from 180	134 position from 180	-	Index of corruption

[6] http://industry.kmu.gov.ua/control/uk/publish/article?art_id=36412&cat_id=36198

Rating of business practices of The World Bank (The Doing Business)	124 position from 155	118 position from 179	139 position from 178	145 position from 181	Rating of conduct of business (ease of company opening, licensing, staff employment, registration of ownership, receipt of credit, defense of interests of investors)
The IMD World Competitiveness Yearbook	46 position from 55	46 position from 55	54 position from 55	56 position from 57	Research of competitiveness (state of economy, efficiency of government, business efficiency and state of infrastructure)
Index of Economic Freedom of Heritage Foundation	99 position from 157	125 position from 161	133 position from 157	152 position from 179	Determination of degrees of freedom of economy (business, auction, financial, monetary, investment, financial, labor freedom, freedom from Government, from a corruption, protection of ownership rights)
Global Competitiveness Index of World Economic Forum	69 position from 125	73 position from 131	72 position from 134	-	Competitiveness (quality of institutes, infrastructure, macroeconomic stability, education, development of financial market, technological level, innovative potential)

Table 9 International ratings of Ukraine[7]

Risks of doing business in Ukraine significantly impact the availability of capital in the country. Commercial loan rates in EURO in Ukraine for the period of over 5 years fluctuated in March – October 2010 between 8% and 10.4% according to the official statistics of the National Bank of Ukraine[8]. For the reference similar rates in Germany for this period fluctuated between 2.3% to 3.6% according to the European Central Bank[9]. Cost of debt financing in Ukraine is at least twice as high than in the Eurozone. The risks of investing into Ukraine are additionally confirmed by the country ratings provided by the Moody's international rating agency and the associated country risk premium. The table below compares country risk premiums for Russia and Ukraine[10]:

Total Risk Premium, %	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Russia	6.6	6.64	6.52	8	6.9	7.25
Ukraine	10.8	10.16	10.04	14.75	12.75	12.5

Table 10 Comparison of the risks of investing in Russia and Ukraine

As it is demonstrated by this table, Russia, while offering a comparable set of investment opportunities, is a significantly less risky country for investing than Ukraine. High interest rates and shortness of the resources of financial institutions make it hard to finance any big infrastructure projects. Such projects are looking upon direct public financing or partnerships between private investors, international financial organizations and government. Large scale privately financed infrastructure projects in Ukraine are hard to come by.

[7] Data by the State Agency of Ukraine for Investments and Innovations

[8] Statistical data. Interest rates in March, 2011 http://www.bank.gov.ua/files/4-Financial_markets(4.1).xls

[9] Germany, Harmonised long-term interest rates for convergence assessment purposes http://www.ecb.europa.eu/stats/money/long/html/index.en.html

[10] Data from Aswath Damodaran, Ph.D., Stern School of Business NYU http://pages.stern.nyu.edu/~adamodar/

4) **Local availability of technologies/techniques, skills and know-how and availability of the best available technologies/techniques in the future.** Due to global market, up-to-date technologies from developed countries are available for purchase, however their cost is high and implementation requires existence of knowledgeable personnel able to introduce and operate the equipment. Currently, lack of investments and lack of modern technologies application experience in Ukraine impede possible modernization projects and further progress of the industry sector.

5) **Fuel prices and availability.** Electricity, coal and natural gas are widely used energy resources in Ukrainian industry. Their distribution networks are well developed, and these energy sources are available for most industrial users. Most of the coal is produced in Ukraine in Luhansk and Donetsk regions. Natural gas is mostly imported from the Russian Federation. Electric energy in Ukraine is produced mainly by fossil fuel fired thermal power stations and nuclear power stations (main types of fuel are natural gas and coil). Wholesale Electricity Market of Ukraine managed by state enterprise "Energorynok" is responsible for marketing of electric energy. Price for electric energy ranges in a large extent for different types of consumers and demand rate, and are regulated by National Electricity Regulatory Commission, which has a special department for cost and prices monitoring and setting. Coal prices are set by coal producers – the companies of private and public property.

Sub step 2a. Identifying and listing plausible future scenarios.

Scenario 1. Continuation of existing situation

This scenario provides a continuation of the current activity of the plant, which assumes a lack of investment in energy efficiency at the plant. The company operates existing equipment that is workable, but consumes a lot of electricity.

Scenario 2. Implementation of energy saving measures at the plant (proposed project activity without JI incentives)

In this scenario, the company realizes a complex of energy saving measures to significantly reduce energy consumption. The modernization, replacement, optimization and setup of the operation mode of motors, pumping equipment and units, the introduction of economic high-pressure dredgers: modernization of ore sorting equipment and optimization of operation mode of underloaded transformer equipment; replacing of lighting units with more energy efficient; installation and putting into operation units of service water supply; installing of frequency converters for pump equipment and electric motors within the project activity.

Scenario 3. Partial implementation of energy saving measures at the plant

In this scenario, the company is implementing several measures of the whole complex of energy saving measures implemented by the project activity. Thus, the developed energy saving program is not being implemented in full and brings only a partial effect.

Sub step 2b. Barrier analysis

Scenario 1. Continuation of existing situation

This scenario is the most plausible, because the company has considerable experience in the use of existing production equipment, which is workable and suitable for the production process. This scenario does not foresee the need to implement any measures, thus there are no barriers related to its implementation.

Scenario 2. Implementation of energy saving measures at the plant (proposed project activity without JI incentives)

Investment barriers: Detailed description of the barriers is provided in Section B.2. of the PDD.

Scenario 3. Partial implementation of energy saving measures at the plant

Investment barriers: In case of only a partial implementation of energy saving measures, the company does not reach significant effect on reducing energy consumption and due to the low amount of emission reductions it is unable to participate in joint implementation mechanism. This scenario is attractive for companies that need substantial investment, but a partial implementation of energy conservation measures does not significantly reduce the power consumption and leads to the significant reduction of greenhouse gases into the atmosphere.

Sub step 2c. Baseline identification

All scenarios, except Scenario 1 - Continuation of existing situation - face prohibitive barriers. Therefore, the following scenarios are the most plausible future scenarios and are identified as baseline scenarios.

This baseline scenario has been established according to the criteria outlined in the Guidance:

1) On a project specific basis;
2) In a transparent manner with regard to the choice of approaches, assumptions, methodologies, parameters, data sources and key factors. All parameters and data are either monitored by the project participants or are taken from sources that provide a verifiable reference for each parameter. Project participants use approaches suggested by the Guidance and the methodological Tools approved by the CDM Executive Board
3) Taking into account relevant national and/or sectoral policies and circumstances, such as sectoral reform initiatives, local fuel availability, power sector expansion plans, and the economic situation in the project sector. The above analysis shows that the chosen baseline is the most plausible future scenario, taking into account the current situation of the economic industry in Ukraine;
4) In such a way that emission reduction units (ERUs) cannot be earned for decreases in activity levels outside the project activity or due to force majeure. According to the proposed approach emission reductions will be earned only when project activity will generate refined oil products, so no emission reductions can be earned due to any changes outside the project activity;
5) Taking account of uncertainties and using conservative assumptions. A number of steps have been taken in order to account for uncertainties and safeguard conservativeness. Default values were used to the extent possible in order to reduce uncertainty and provide conservative data for emission calculations.

Baseline emissions

In order to calculate baseline emissions following assumptions were made:

1) The project activity does not affect the iron ore concentrate production level;
2) The iron ore concentrate production level within the project activity will meet the iron ore concentrate production level in baseline scenario;
3) Method of production of iron ore concentrate in the baseline and project scenarios is the same;
4) Characteristics of the final product of the baseline and project scenarios are the same.

Baseline emissions come from one major source:

- Carbon dioxide emissions from the consumption of electricity produced by the United Energy System of Ukraine.

GHG emissions in baseline scenario in period *y* are calculated as follows:

$$BE_y = BE_{EL,y}, \quad \textit{(Equation B-1)}$$

where:

BE_y - GHG emissions in baseline scenario in period *y*, tCO_2e;

$BE_{EL,y}$ - GHG emissions in baseline scenario from electricity consumption in period *y*, tCO_2e.

GHG emissions in baseline scenario from electricity consumption are in turn calculated as follows:

$$BE_{EL,y} = P_{iron,y} \times SEC_{BL,iron} \times EF_{EL,grid,y}, \quad \textit{(Equation B-2)}$$

where:

$BE_{EL,y}$ – GHG emissions in baseline scenario from electricity consumption in period *y*, tCO_2e;

$P_{iron,y}$ – Production of iron ore concentrate in period *y*, t;

$SEC_{BL,iron}$ – Specific consumption of electricity for production of iron ore concentrate in baseline scenario, MWh/t;

$EF_{EL,grid,y}$ – Specific indirect carbon dioxide emission factor from electricity consumption by the 1st class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052 in period *y,* tCO_2/MWh.

Key information and data used to establish the baseline (variables, parameters, data sources etc.) are provided below in tabular form:

Data/Parameter	$P_{iron,y}$
Data unit	t
Description	Production of iron ore concentrate in period *y*
Time of determination/monitoring	Measured continuously
Source of data (to be) used	Project owner records
Value of data applied (for ex ante calculations/determinations)	Set ex-post during monitoring
Justification of the choice of data or description of measurement methods	Calculated in accordance with accepted company's policy
QA/QC procedures (to be) applied	Measurement of this parameter is performed with specialized equipment that runs regular calibration and verification. Involved staff is qualified to perform monitoring
Any comment	No

Data/Parameter	$SEC_{BL,iron}$
Data unit	MWh/t
Description	Specific consumption of electricity for production of iron ore concentrate in baseline scenario
Time of determination/monitoring	Fixed during the development phase of the project
Source of data (to be) used	Project owner records
Value of data applied (for ex ante calculations/determinations)	0.1486
Justification of the choice of data or description of measurement methods	Accepted on the basis of historical data
QA/QC procedures (to be) applied	In accordance with accepted standards of project owner
Any comment	For more detail information refer to Annex 2

Data/Parameter	$EF_{EL,grid,y}$
Data unit	tCO_2/MWh
Description	Specific indirect carbon dioxide emission factor from electricity consumption by the 1st class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052 in period *y*
Time of determination/monitoring	Annually
Source of data (to be) used	Orders or data from DFP of Ukraine or other competent studies (data for 2008-2011 are available in orders by National Environmental Investment Agency of Ukraine (Order # 62 dated 15/04/2011, Order # 63 dated 15/04/2011, Order # 43 dated 28/03/2011, Order # 75 dated 12/05/2011[11]; data for 2007 is available in the study Standardized emission factors for the Ukrainian electricity grid[12])
Value of data applied (for ex ante calculations/determinations)	Determined during the monitoring
Justification of the choice of data or description of measurement methods	The calculation is made taking into account country-specific data for Ukraine
QA/QC procedures (to be) applied	In the absence of new values, the most recent values of specific indirect carbon dioxide emissions for electricity consumption will be used
Any comment	No

Table 11 Key information and data used to establish the baseline

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:

[11] http://neia.gov.ua/nature/control/uk/publish/category?cat_id=111922

[12] The study is presented in Annex 2

According to the "Guidelines for Users of the Joint Implementation Project Design document Form" version 04[13], the following step-wise approach to demonstrate that the project carbon dioxide emissions reductions by sources are additional with respect to any other emissions reductions is used:

Step 1. Indication and description of the approach applied

As suggested by Paragraph 44 (c) of the Annex 1 of the "Guidelines on criteria for baseline setting and monitoring" version 03[14], the additionality can be demonstrated by using the "Tool for the demonstration and assessment of additionality" approved by the CDM Executive Board. While developing of this PDD, the latest version of the "Tool for the demonstration and assessment of additionality" approved by the CDM Executive Board, was 06.0.0, thus it was used to demonstrate the project activity additionality.

Step 2. Application of the approach chosen

The following steps are taken as per "Tool for the demonstration and assessment of additionality" version 06.0.0.

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

We will define realistic and credible alternatives to the project activity through the following Sub-steps:

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

The following alternatives were offered for the proposed project activity:

Alternative 1. Implementation of energy saving measures at the plant (proposed project activity without JI incentives)

In this scenario, the company realizes complex energy-saving measures to significantly reduce energy consumption. This scenario is similar to the project activity, but in this case, the company does not receive benefits from the development of joint implementation project.

Alternative 2. Continuation of the current situation

This scenario is a continuation of the current activity of the plant, which involves no significant investments in energy efficiency at the plant. The company operates existing equipment that is workable, but consumes a lot of electricity.

Outcome of Sub-Step 1a: We have identified realistic and credible alternative scenarios to the project activity.

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

There are no legislative requirements that would force the company PJSC "Ingulets iron ore enrichment works" change the current practice, since:

- Existing equipment is in working condition without any modernization;
- Equipment installed at the plant meets all the requirements of applicable law, and there are no changes in legislation over the next years planned;
- Current practice is in line with the requirements of current environmental legislation.

[13] http://ji.unfccc.int/Ref/Documents/Guidelines.pdf

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

Under the following circumstances all of the alternatives identified above are consistent with mandatory laws and regulations of Ukraine.

Outcome of Sub-step 1b: We have identified realistic and credible alternative scenarios to the project activities that are in compliance with mandatory legislation and regulations taking into account the enforcement in the Ukraine.

Step 2. Investment Analysis

The purpose of the investment analysis in the context of additionality is to determine whether the proposed project activity is not:

a) The most economically or financially attractive; or
b) Economically or financially feasible, without the revenue from the sale of emission reductions units.

Sub-step 2a: Determine appropriate analysis method

Generally, there are three methods that can be applied to investment analysis: simple cost analysis, investment comparison analysis and benchmark analysis.

A simple cost analysis (Option I) applies where the proposed JI project and its alternatives identified in Step 1, do not bring any financial profit, but revenue from the ERUs sale. The introduction of the proposed project will save electricity because of the complex energy efficiency measures at the plant. Thus, this method is unacceptable

An investment comparison analysis (Option II) compares suitable financial indicators for realistic and credible investment alternatives. As only plausible alternative represents the continuation of existing situation, a benchmark analysis (Option III) is applied.

Sub-step 2b: Option III. Apply benchmark analysis

The proposed project which is the implementation of energy saving measures at PJSC "Ingulets iron ore enrichment works" applied for the benchmark analysis the indicator of Net Present Value (NPV). The goal of analysis will be to show that the project activity not undertaken as a joint implementation project will not be financially attractive and will lead to negative value of NPV. This benchmark has been selected for a number of reasons

1. The project owner does not have formalized internal benchmark that is systematically applied during project evaluation;
2. No governmental approved benchmark is available for projects of this kind in Ukraine;
3. Positive/negative NPV is a generally accepted project evaluation benchmark. Its use is encouraged by many project finance professionals, while IRR is considered to be controversial and is not recommended as the single benchmark for project evaluation [15].

Sub-step 2c: Calculation and comparison of financial indicators

The financial analysis refers to the time of investment decision-making. The data provided by the project participant were used to perform calculations.

The following assumptions were used for the calculation of cash flows and indicators:

1) Investment decision date is taken as 12st of January 2005. Prices, tariffs and costs for the analysis are taken as of that date;

[15] *Principles of Corporate Finance 7th edition, Richard A. Brealey, Stewart C. Myers, McGraw-Hill Higher Education, 2003 – p. 105*

2) Net Present Value (NPV) is calculated for the period from 2006 to 2020 (15 years);
3) All calculations will be done in local currency – UAH.

As the discount rate for calculating NPV weighted average rate of annual growth rates in long-term loans was adopted, granted by banks to business entities as of 2005 as it is stated in the bulletin of the National Bank of Ukraine No. 11/2006 (164)[16], that is equal to 15.6%. This rate is chosen as a composite index that takes into account the cost of risk-free financing increased by the level of risk that is typical for project financing by banks in the country in the stated period. For the calculation of the project index and its comparison with the reference benchmark, the project cash flow model was developed.

NPV calculation results are given in the table below:

Project activity	***NPV, thousand UAH***
Implementation of energy saving measures at the plant	**-10 974**

Table 12 Financial indicators

As it can be seen from the table, the possible project activity results in negative NPV under current conservative discount rate. This means that any investor wishing to invest into such project will lose value of his investment instead of increasing it. Hence, the project cannot be considered as a financially attractive course of action.

Sub-step 2d: Sensitivity analysis

A sensitivity analysis should be made to show whether the conclusion regarding the financial/economic attractiveness is robust to reasonable variations in the critical assumptions, as it can be seen by application of the Methodological Tool "Tool for the demonstration and assessment of additionality" (Version 06.0.0). As suggested in the Guidance on the Assessment of Investment Analysis[17] (version 05) referenced by this Tool, variations of the key factors in the sensitivity analysis should cover at least the range of +10% and –10%.

The following two key indicators were considered in the sensitivity analysis: investment cost of electric energy price. The other cost components and factors account for less than 5 % of total project costs or total project revenues and therefore are not considered in the sensitivity analysis.

The following four scenarios were proposed in order to explore the sensitivity of the analysis results.

Scenario 1 considers 10% decrease of investment cost required for the implementation of energy saving measures.

Scenario 2 is based on the assumption of a 10% investment cost increase.

Scenario 3 considers 10% electric energy price decrease for the plant.

Scenario 4 is based on the assumption of the 10% electric energy price increase for the plant.

Results of the analysis are provided in the table below.

Scenario	***NPV, thousand UAH***

[16] http://www.bank.gov.ua/doccatalog/document?id=43900 page 90

[17] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

Base Case	-10 974
Scenario 1 (Investment cost -10%)	-1 789
Scenario 2 (Investment cost +10%)	-16 905
Scenario 3 (Electric energy price +10%)	-6 091
Scenario 4 (Electric energy price -10%)	-15 856

Table 13 Project sensitivity analysis

As we can see from the table, the project does not reach positive NPV under any of the introduced assumptions. Thus, the sensitivity analysis results presented above demonstrate the robustness of conclusions made in sub-step 2c. It can be concluded that project activity is unlikely to be financially/economically attractive.

Outcome of Step 2: After the sensitivity analysis, it is concluded that the proposed JI project activity is unlikely to be financially/economically attractive.

Step 3: Barrier analysis

Not applicable.

Step 4: Common practice analysis

Sub-step 4a: Analyze other activities similar to the proposed project activity:

A common practice in Ukraine is the use of old production facilities that remained from the Soviet Union times, without investing significant funds and performing only small repairs scheduled for maintenance of the equipment. Existing mining and processing plants in Ukraine are large plants with extensive material and technical basis, which mostly includes obsolete equipment and a large staff of employees. Companies usually try to keep the current activities from decline and do not have sufficient funds to implement investment programs.

Ukraine has no such projects, except those that are introduced or intend to be implemented with the incentive of the Joint Implementation mechanism. This project is:

- Realization of a complex of energy saving activities at Ferrexpo Poltava Mining [18]

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

It is required to follow Sub-step 4b according to the Tool when this project is widely observed and commonly carried out. The proposed JI project does not represent a widely observed practice in the area considered (see Sub-step 4a). There is no similar activity that can be observed in Ukraine and those implemented as JI projects are excluded from the analysis. Therefore, this sub-step is not applied. The facts mentioned above allow concluding that the proposed JI project is not common practice in Ukraine.

Sub-steps 4a and 4b are satisfied, i.e. similar activities cannot be widely observed. Thus proposed project activity is not a common practice.

Conclusion: Thus, the additionality analysis has demonstrated that project emission reductions are additional to any that would otherwise occur. .

[18] http://ji.unfccc.int/JIITLProject/DB/T9A82XX512VJESASPK6VVTVU9GJE4B/details

Step 3. Project additionality justification

Investment analysis showing the financial indicators of the project was provided to a determinator.

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

The project activities are physically limited to the plant site of PJSC "Ingulets iron ore enrichment works". At the same time, some sources of GHG emissions are indirect – carbon dioxide emissions due to the consumption of power from the Ukrainian electricity grid.

The table below shows an overview of all emission sources in the baseline and project scenarios. Project boundary has been delineated in accordance with provisions of Paragraphs 14 and 16 of the "Guidelines on criteria for baseline setting and monitoring" (Version 03).

	Source	Gas	Included/Excluded	Justification / Explanation
Baseline scenario	Electricity consumption by the plant for the production of iron ore concentrate	**CO_2**	**Included**	**The main source of emissions. The electricity will be consumed from the Ukrainian grid**
		CH_4	Excluded	Neglected for simplification. Conservatively.
		N_2O	Excluded	Neglected for simplification. Conservatively.
	Natural gas consumption	CO_2	Excluded	The project activity has minimal impact on natural gas consumption. Neglected for simplification.
		CH_4	Excluded	
		N_2O	Excluded	
	Diesel fuel consumption	CO_2	Excluded	The project activity has minimal impact on the consumption of diesel fuel. Neglected for simplification.
		CH_4	Excluded	
		N_2O	Excluded	
Project scenario	Electricity consumption by the plant for the production of iron ore concentrate	**CO_2**	**Included**	**The main source of emissions. The electricity will be consumed from the Ukrainian grid**
		CH_4	Excluded	Neglected for simplification. Conservatively.
		N_2O	Excluded	Neglected for simplification. Conservatively.
	Natural gas consumption	CO_2	Excluded	The project activity has minimal impact on natural gas consumption. Neglected for simplification.
		CH_4	Excluded	
		N_2O	Excluded	
	Diesel fuel consumption	CO_2	Excluded	The project activity has minimal impact on the consumption of diesel fuel. Neglected for
		CH_4	Excluded	

		N_2O	Excluded	simplification.

Table 14 Sources of emissions in the baseline and project scenarios

The boundaries of the baseline and project scenarios encompass emissions associated with the consumption of electricity from the grid.

The spatial boundaries of the project include physical (geographic) location of emission sources. Project boundaries coincide with the physical boundaries of enterprise PJSC "Ingulets iron ore enrichment works" and include the Ukrainian grid, which produces electricity to satisfy the production needs of the enterprise.

Emissions sources of the JI project is the production equipment of PJSC "Ingulets iron ore enrichment works", i.e. all emission sources under the control of the project participants.

Baseline scenario

The baseline scenario is the continuation of the existing situation. The plant operates a large amount of electrical equipment that consumes electricity from the grid. Since most of the equipment is outdated and has low energy efficiency, the level of electric energy consumption at the plant is high.

Carbon dioxide emissions in the baseline scenario are generated due to the electric energy consumption by the electric equipment of PJSC "Ingulets iron ore enrichment works".

Project scenario

In the project scenario, the company has implemented a complex program of energy conservation, which is aimed at significant reduction of energy consumption, as well as reduction of GHG emissions into the atmosphere. The company is carrying out the modernization and replacement of old equipment, as well as optimization of operation modes, reconstruction of water supply and other energy saving measures within the program of energy conservation. As a result, at a constant capacity of the main product - iron ore, a significant reduction of specific energy consumption was achieved.

Carbon dioxide emissions in the baseline scenario are generated due to the electric energy consumption by the electric equipment of PJSC "Ingulets iron ore enrichment works".

Leakages

Project activity, including measures envisaged, will not have any effect on the production level, but it enhances it through the introduction of modern equipment and technology. These measures do not effect on emissions outside the project except those that could be avoided by reducing the electric energy consumption from the Ukrainian grid. In addition, these measures reduce consumption of electricity. So all the leakages that may result from possible accidental emissions associated with fuel extraction, production and distribution of electricity will be reduced within project activity. All equipment has been replaced with modern one, thus it will not be used, so it will not cause generation of any leakages.

Hence, no leakages are expected.

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

Date of baseline setting: 14/09/2012.

Name of person/entity setting the baseline:

Name: Levitsky Andriy Pavlovych, General director

Company name: PJSC "Ingulets iron ore enrichment works"

E-mail: info@ingok.com.ua

Phone: +38 (056) 407-63-09

Fax: +38 (056) 407-63-11

PJSC "Ingulets iron ore enrichment works" is the project participant. Contact details are available in Annex 1.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Starting date of the project is 12/01/2005. This is the date when the decision on investment into measures aimed at reduction of electricity consumption was made.

C.2. Expected operational lifetime of the project:

The expected lifetime of the project is at least 15 years and 0 months or 180 months.

C.3. Length of the crediting period:

The crediting period will last from 01/01/2007 to 31/12/2020. Length of crediting period will estimate to 14 years and 0 months or 168 months.

In the period from 1 January 2008 to 31 December 2012, emission reductions will be transferred in accordance with Article 6 of the Kyoto Protocol (JI mechanism).

Emission reductions generated after 2013 can be used in accordance with the relevant decisions of the UNFCCC. The extension of crediting period after 2012 is subject to approval from the Host country.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

This monitoring plan is established in accordance with appendix B of the JI guidelines and the "Guidance on criteria for baseline setting and monitoring" version 03 developed by the JISC. The description of the monitoring plan chosen is provided using the following step-wise approach:

Step 1. Indication and description of the approach chosen regarding monitoring

Option *a* provided by the "Guidelines for the Users of the Joint Implementation Project Design Document Form", Version 04[19] is used. JI specific approach is used in this project provided by "Guidelines on criteria for baseline setting and monitoring" version 03 (Paragraph 9 (*a*)) and therefore it will be used for establishment of monitoring plan. The monitoring plan will provide for:

1. *Collection and archiving of all relevant data necessary for estimating or measuring anthropogenic emissions by sources of GHGs occurring within the project boundary during the crediting period:*

   A clear management structure will be identified to establish the division of responsibilities for gathering monitoring data. Respective services of the plant will collect relevant data in the form of technical reports and other statistical documents. All monitored data will be stored both electronically and in hard copy. The data will be archived and be kept at least two years after last transaction Emission Reduction Units (ERUs) by the project.

2. *Collection and archiving of all relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary during the crediting period:*

   The baseline data fixed ex-ante will be determined using statistical data collected for almost 3 years prior the project implementation. Data from technical reports, control measurements and calculations and other statistical documents will be applied. All monitored data will be stored both electronically and in hard copy. The data will be archived and be kept at least two years after last transaction ERUs by the project.

3. *Identification of all potential sources of, and the collection and archiving of data on increased anthropogenic emissions by sources of GHGs outside the project boundary that are significant and reasonably attributable to the project during the crediting period:*

   No leakages take place during the project activities. The only source of greenhouse gas emissions outside the project boundaries and attributable to the project are emissions from electric energy generation at power plants operating on combustive fuel. This source is considered in the monitoring of greenhouse gas emissions by use of applying *the specific indirect carbon dioxide emission factor from electricity consumption by the 1st class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052*, calculated for each year by the Ukrainian DFP, namely – the State Environmental Investment Agency of Ukraine, or SEIA (former name - the National Environmental Investment Agency of Ukraine, or NEIA).

[19] http://ji.unfccc.int/Ref/Documents/Guidelines.pdf

4. *Quality assurance and control procedures for the monitoring process:*

   The quality of collected data will be secured by conducting regular calibrations of applied measurement equipment and sensors. Calibration period will be chosen in accordance with passport data or equipment specifications. Regional representatives of the State Metrological System of Ukraine and instrumental department of the company will carry out the calibration procedures and internal calibration. All measurement devices will be kept in optimal conditions. If any malfunction occurs, the meter will be displaced with similar one and the monitored data will be cross-checked and calculated by use of statistical information. The troubleshooting will be made by maintenance mechanics or on-duty electrician/operator.

5. *Procedures for the periodic calculation of the reductions of anthropogenic emissions by sources by the proposed JI project, and for leakage effects, if any:*

   Calculation of anthropogenic emissions by sources will take place on a periodic basis. Data for the respecting period will be collected by the company and transferred to the entities responsible for the calculation of emission reductions. Obtained data will be processed and greenhouse gas emissions will be calculated according to the latest carbon emission factors and regulations in power

Step 2. Application of the approach chosen

Key factors affecting the project were included in Section B.1.

Project activity will include monitoring of greenhouse gases. Details on the source of emissions in the project and baseline scenarios and equations for calculating the emission reductions are presented in Section D.1.1. - D.1.4. below.

To calculate the emissions in the baseline and project scenarios and emission reductions under the project, the following assumptions were made:

1) The project activity does not affect the iron ore concentrate production level;
2) The iron ore concentrate production level within the project activity will meet the iron ore concentrate production level in baseline scenario;
3) Method of production of iron ore concentrate in the baseline and project scenarios is the same;
4) Characteristics of the final product of the baseline and project scenarios are the same.

Defining data and parameters used for monitoring

a) Data and parameters that are not monitored throughout the crediting period, but are determined only once (and thus remain fixed throughout the crediting period), and that are available already at the stage of PDD determination:

Parameter	Value	Unit	Description	Source of data
$SEC_{BL,iron}$	0.1486	MWh/t	Specific consumption of electricity for production of iron ore concentrate in baseline scenario	Technical reports of the plant. Fixed during the development phase of the project

Table15 Data and parameters that are not monitored throughout the crediting period, but are determined only once, and that are available already at the stage of PDD determination

b) Data and parameters that are not monitored throughout the crediting period, but are determined only once (and thus remain fixed throughout the crediting period), but that are not already available at the stage of determination regarding the PDD:

There are no these data and parameters under the Project;

c) Data and parameters that are determined during the crediting period:

Parameter	Value	Unit	Description	Source of data
$P_{iron,y}$	To be determined during the monitoring	t	Production of iron ore concentrate in period *y*	Technical reports of the plant
$EC_{iron,y}$	To be determined during the monitoring	MWh	Consumption of electricity for production of iron ore concentrate in period *y*	Technical reports of the plant
$EF_{EL,grid,y}$	To be determined during the monitoring	tCO_2/MWh	Specific indirect carbon dioxide emission factor from electricity consumption by the 1st class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052 in period *y*	Orders or data from DFP of Ukraine or other competent studies (data for 2008-2011 are available in orders by National Environmental Investment Agency of Ukraine (Order # 62 dated 15/04/2011, Order # 63 dated 15/04/2011, Order # 43 dated 28/03/2011, Order # 75 dated 12/05/2011; data for 2007 is available in the study Standardized emission factors for the Ukrainian electricity grid)

Table 16 Data and parameters that are determined during the crediting period

The monitoring process involves the actions aimed at minimization of uncertainty and ensuring of accuracy:

1) The default values are used to the extent possible to reduce uncertainty and ensure the reliability of data for emissions calculation;
2) Devices used to measure the project parameters run appropriate checks and calibration, and provide high accuracy of measurements;

3) In the absence of appropriate data, baseline and project values are calculated using conservative assumptions.

Measuring devices

Monitoring of the project activity is based on the measurement of parameters such as: production of iron ore concentrate and electricity consumption for its production. These data are recorded in the technical reports and statistical document of the plant.

Measurements are based on the following meters: electricity consumption is measured by electricity meters installed at all major points of distribution and supply. Measurement of iron ore concentrate is performed using surveying method.

Archiving and data storage

Documents and reports on the data that are monitored will be archived and stored by the project participants. The following documents will be stored: technical reports, primary documents for the accounting of monitored parameters in paper form; intermediate reports, and other monitoring documents in paper and electronic form. These documents and other data monitored and required for determination and verification, as well as any other data that are relevant to the operation of the project will be kept for at least two years after the last transfer of ERUs.

Training of monitoring personnel

The project will utilize new technologies that require skills and knowledge in modernization, setup and operation of pumping equipment, motors, electrical equipment, etc. This kind of skills and knowledge is available locally through the system of vocational training and education. Only workers with proper training can be allowed to operate industrial equipment. Health and safety department is responsible for personnel training and examination. Management of the project host will ensure that personnel of the project have received proper training and are eligible to work with the prescribed equipment.

Training on safety issues is mandatory and must be provided to all personnel of the project as required by local regulations. Procedure for safety trainings includes the scope of the trainings, training intervals, forms of training, knowledge checks etc. The project host management will maintain records for such trainings and periodic knowledge check-ups.

Activities that are directly related to the monitoring do not require specific training other than provided by the professional education. However, monitoring personnel will receive training on monitoring procedures and requirements. Personnel of the project host management will receive necessary training and consultations on Kyoto Protocol, JI projects and monitoring from the project participants.

Procedures identified for corrective actions in order to provide more accurate monitoring and reporting in future

In cases if any errors, fraud or inconsistencies will be identified during the monitoring process special commission will appointed by project host management that will conduct a review of such case and issue an order that must also include provisions for necessary corrective actions to be implemented that will ensure such situations are avoided in future.

The project host management will also establish a communication channel that will make it possible to submit suggestions, improvement proposals and project ideas for more accurate monitoring in future for every person involved in the monitoring activities. Such communications will be delivered to the project host management who is required to review these communications and in case it is found appropriate implement necessary corrective actions and improvements. Project participant will conduct periodic review of the monitoring plan and procedures and if necessary propose improvements to the project participants.

Emergency preparedness for cases where emergencies can cause unintended emissions

The project operation does not foresee any factors or emergencies that can cause unintended GHG emissions. Safe operation of equipment and personnel is ensured by systematic safety training. Procedures for dealing with general emergencies such as fire, major malfunction etc. is developed as part of the mandatory business regulations and is in accordance with local requirements.

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
P1	$EC_{iron,y}$– Consumption of electricity for production of iron ore concentrate in period *y*	Technical reports of the plant	MWh	m	Monthly with annual totals	100%	Electronic and paper	
P2	$EF_{EL,grid,y}$– Specific indirect carbon dioxide emission factor from electricity consumption by the 1st class electricity consumers according to the Procedure for determining the	Orders or data from DFP of Ukraine or other competent studies (data for 2008-2011 are	tCO_2/MWh	m	Annually	100%	Electronic and paper	

	class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052 in period *y*	available in orders by National Environmental Investment Agency of Ukraine (Order # 62 dated 15/04/2011, Order # 63 dated 15/04/2011, Order # 43 dated 28/03/2011, Order # 75 dated 12/05/2011; data for 2007 is available in the study Standardized emission factors for the Ukrainian electricity grid)						

Table 17 Data to be collected in order to calculate project emissions

These documents and other data monitored and required for determination and verification, as well as any other data that are relevant to the operation of the project will be kept for at least two years after the last transfer of ERUs by the project.

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

Project emissions are calculated as follows:

$$PE_y = PE_{EL,y}, \qquad \textit{(Equation P-1)}$$

where:

PE_y – GHG emissions in project scenario in period *y*, tCO_2e;

$PE_{EL,y}$ – GHG emissions in project scenario from electricity consumption in period *y*, tCO_2e.

GHG emissions in project scenario for electricity consumption are in turn calculated as follows:

$$PE_{EL,y} = EC_{iron,y} \times EF_{EL,grid,y}, \qquad \textit{(Equation P-2)}$$

where:

$PE_{EL,y}$ – GHG emissions in project scenario from electricity consumption in period *y*, tCO_2e;

$EC_{iron,y}$ – Electricity consumption for production of iron ore concentrate in project scenario in period *y*, MWh;

$EF_{EL,grid,y}$ – Specific indirect carbon dioxide emission factor from electricity consumption by the 1st class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052 in period *y,* tCO_2/MWh.

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
B1	$P_{iron,y}$ – Production of iron ore	Technical reports of	t	m	Monthly with	100%	Electronic	

	concentrate in period *y*	the plant			annual totals. Fixed ex-ante		and paper	
B2	$SEC_{BL,iron}$ – Specific consumption of electricity for production of iron ore concentrate in baseline scenario	Technical reports of the plant	MWh/t	c	Technical reports of the plant. Fixed while project development	100%	Electronic and paper	
B3	$EF_{EL,grid,y}$ – Specific indirect carbon dioxide emission factor from electricity consumption by the 1st class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052 in period *y*	Orders or data from DFP of Ukraine (data for 2008-2011 are available in orders by National Environmental Investment Agency of Ukraine (Order # 62 dated 15/04/2011, Order # 63 dated 15/04/2011, Order # 43 dated 28/03/2011, Order # 75 dated 12/05/2011) or other competent studies	tCO_2/ MWh	m	Annually	100%	Electronic and paper	

Table 18 Data to be collected in order to calculate baseline emissions

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 baseline scenario in period *y* are calculated as follows:

$$BE_y = BE_{EL,y}, \qquad \textit{(Equation B-1)}$$

where:

BE_y - GHG emissions in baseline scenario in period *y*, tCO_2e;

$BE_{EL,y}$ - GHG emissions in baseline scenario from electricity consumption in period *y*, tCO_2e.

GHG emissions in baseline scenario from electricity consumption are in turn calculated as follows:

$$BE_{EL,y} = P_{iron,y} \times SEC_{BL,iron} \times EF_{EL,grid,y}, \qquad \textit{(Equation B-2)}$$

where:

$BE_{EL,y}$ – GHG emissions in baseline scenario from electricity consumption in period *y*, tCO_2e;

$P_{iron,y}$ – Production of iron ore concentrate in period *y*, t;

$SEC_{BL,iron}$ – Specific consumption of electricity for production of iron ore concentrate in baseline scenario, MWh/t;

$EF_{EL,grid,y}$ – Specific indirect carbon dioxide emission factor from electricity consumption by the 1st class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052 in period *y,* tCO_2/MWh.

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

This section is left blank on purpose.

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

This section is left blank on purpose.

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):

According to the specific approach for JI projects emissions reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad \text{(Equation ER-1)}$$

where:

ER_y – GHG emissions reduction in period y, tCO_2e;

BE_y – GHG emissions in baseline scenario in period y, tCO_2e;

PE_y – GHG emissions in project scenario in period y, tCO_2e;

LE_y – GHG leakages in period y, tCO_2e.

Results of the emissions calculations are presented in metric tons of carbon dioxide equivalent (tCO_2e), 1 metric tons of carbon dioxide equivalent is equal to 1 metric tons of carbon dioxide (tCO_2), i.e. 1 tCO_2e = 1 tCO_2.

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

Project activity, as well as measures envisaged will not affect the production level of the plant, but will enhance it through the introduction of modern equipment and technologies. These measures do not affect emissions outside the project except those that could be avoided by reducing the electric energy consumption from the Ukrainian grid. In addition, these measures reduce consumption and electricity. So all the leakages that may result from possible accidental emissions associated with fuel extraction, production and distribution of electricity will be reduced under the project activity. All equipment has been replaced with modern, and will not be used, so it will not cause generation of any leakages.

$LE_y = 0$

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

Not applicable.

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):

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \qquad \text{(Equation ER-2)}$$

where:

ER_y – GHG emissions reduction in period y, tCO_2e;

BE_y – GHG emissions in baseline scenario in period y, tCO_2e;

PE_y – GHG emissions in project scenario in period y, tCO_2e;

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

Information on the environmental impact by the project will be collected by the Department of environmental protection and will remain in print for the entire crediting period and two years after the last transfer of ERUs.

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.
Table 16: # *P1*	Low	The amount of electricity consumed is continuously measured by electricity meters. They undergo regular calibration and verification in accordance with the operating instructions.
Table 16: # *P2* Table 17: # *B3*	Low	The Orders of the State Environmental Investment Agency or other relevant studies will be used as a data source. Emission factors shall be calculated using the country-specific data for Ukraine. Starting in 2011, new emission factors must be issued by the State Environmental Investment Agency of Ukraine (SEIA) on an annual basis. In case SEIA does not issue new emission factors for calculations, the most recent values or the value of other competent sources will be used.
Table 17: # *B1*	Low	Measurements of iron ore concentrate produced are carried out by surveying method using specialized equipment that undergo regular calibration and verification in accordance with the operating instructions.
Table 17: # *B2*	Low	To set this value, iron ore production and electric energy consumption technical reports of the plant are used. Measurement of these parameters was carried out using measurement equipment that underwent regular calibration and verification in accordance with the operating instructions.

Table19 Quality control (QC) and quality assurance (QA) procedures

To ensure the accuracy of the measurement process, measuring equipment shall be regularly calibrated and regularly checking to the performance in accordance with existing control procedures. In the event of any error or defect is detected, corrective actions are immediately to be implemented, controlled value will be checked by other parameters or extrapolated from previous measurements to reduce uncertainty and ensure accuracy. Responsible employees are properly qualified to perform measurement and recording of data.

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

The purpose of the monitoring plan is to provide clear, reliable and accurate compliance with assessment procedures, monitoring and verification of project activities. These procedures are designed to ensure continuous monitoring of the project activity and key performance indicators, and to determine the results of the project and the emissions reductions of greenhouse gases emissions.

The monitoring plan will be implemented using a developed clear structure of responsibilities. Operating personnel will receive data from meters and transmit them to the relevant departments, in which data will be collected and structured for calculating of greenhouse gas emissions. All departments of the company will need to provide information relating to the monitoring of JI project.

The following departments are involved into the collection and transmission of data for monitoring:

Energy Management Service

The Service monitors electricity consumption and production of iron ore concentrate at the enterprise. Energy Management Service will be responsible for the transfer of all the information collected on the project to the project developer. The Service will collect, process, calculate and store all monitoring data in electronic and paper form. It will provide information about the implemented technologies and monitor project activity.

Department of Environmental Protection
Department of Environmental Protection is responsible for the environmental side of project activity and relationships with local and central authorities. Department receives the necessary permits for the enterprise and ensures that the impact on the environment by the plant is acceptable. It is responsible for the provision of environmental documentation for determination and verification.

Metrology Department
Metrology Department is responsible for data on all meters used for monitoring. This department performs the calibration procedure of measuring equipment in the company and provides the calibration or verification of meter by regional representatives of the State Metrological System of Ukraine.

Occupational Health Department
Occupational health department monitors the compliance of the company and personnel to safety requirements and existing standards. The department is responsible for periodic trainings and checking of personnel.

Upon request, other parts of the enterprise will provide the necessary data for project monitoring.

The overall structure that the project owner will apply while implementing the monitoring plan is presented in the following figure:

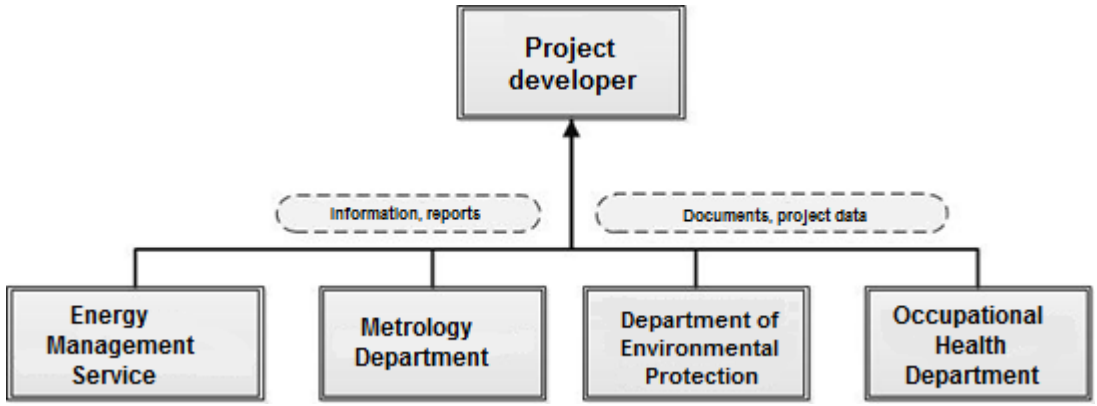

Figure 4 The operational structure of data collection used for monitoring of emission reductions

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

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

Name: Levitsky Andriy Pavlovych, General director

Company name: PJSC “Ingulets iron ore enrichment works”

E-mail: info@ingok.com.ua

Phone: +38 (056) 407-63-09

Fax: +38 (056) 407-63-11

PJSC “Ingulets iron ore enrichment works” is the project participant. Contact details are available in Annex 1.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Parameter	Unit	2007	Total
GHG emissions in project scenario from electricity consumption	tCO_2e	1 761 820	**1 761 820**
Total project GHG emissions	tCO_2e	**1 761 820**	**1 761 820**

Table 20 Estimated project emissions for 2007

Year	GHG emissions in project scenario from electricity consumption (tons of CO_2 equivalent)	Total project GHG emissions (tons of CO_2 equivalent)
2008	1 877 166	**1 877 166**
2009	1 827 621	**1 827 621**
2010	2 235 006	**2 235 006**
2011	2 222 787	**2 222 787**
2012	2 222 787	**2 222 787**
Total	**10 385 367**	**10 385 367**

Table 21 Estimated project emissions for 2008-2012

Year	GHG emissions in project scenario from electricity consumption (tons of CO_2 equivalent)	Total project GHG emissions (tons of CO_2 equivalent)
2013	2 222 787	**2 222 787**
2014	2 222 787	**2 222 787**
2015	2 222 787	**2 222 787**
2016	2 222 787	**2 222 787**
2017	2 222 787	**2 222 787**
2018	2 222 787	**2 222 787**
2019	2 222 787	**2 222 787**
2020	2 222 787	**2 222 787**
Total	**17 782 296**	**17 782 296**

Table 22 Estimated project emissions for 2013-2020

E.2. Estimated leakage:

In the project activity no leakages are not expected. Refer to Section D.1.3. for more information.

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

Parameter	Unit	2007	Total
Total project GHG emissions	tCO_2e	**1 761 820**	**1 761 820**

Table 23 Estimated total project emissions for 2007

Year	Total project GHG emissions (tons of CO_2 equivalent)
2008	**1 877 166**
2009	**1 827 621**
2010	**2 235 006**
2011	**2 222 787**
2012	**2 222 787**
Total	**10 385 367**

Table 24 Estimated total project emissions for 2008-2012

Year	Total project GHG emissions (tons of CO_2 equivalent)
2013	**2 222 787**
2014	**2 222 787**
2015	**2 222 787**
2016	**2 222 787**
2017	**2 222 787**
2018	**2 222 787**
2019	**2 222 787**
2020	**2 222 787**
Total	**17 782 296**

Table 25 Estimated total project emissions for 2013-2020

E.4. Estimated baseline emissions:

Parameter	Unit	2007	Total
GHG emissions in baseline scenario from electricity consumption	tCO_2e	1 820 100	**1 820 100**
Total baseline GHG emissions	tCO_2e	**1 820 100**	**1 820 100**

Table 26 Estimated baseline emissions for 2007

Year	GHG emissions in baseline scenario from electricity consumption (tons of CO_2 equivalent)	Total baseline GHG emissions (tons of CO_2 equivalent)
2008	2 030 396	**2 030 396**
2009	1 828 655	**1 828 655**
2010	2 337 871	**2 337 871**
2011	2 286 749	**2 286 749**
2012	2 286 749	**2 286 749**
Total	**10 770 420**	**10 770 420**

Table 27 Estimated baseline emissions for 2008-2012

Year	GHG emissions in baseline scenario from electricity consumption (tons of CO_2 equivalent)	Total baseline GHG emissions (tons of CO_2 equivalent)
2013	2 286 749	**2 286 749**
2014	2 286 749	**2 286 749**
2015	2 286 749	**2 286 749**
2016	2 286 749	**2 286 749**
2017	2 286 749	**2 286 749**
2018	2 286 749	**2 286 749**
2019	2 286 749	**2 286 749**
2020	2 286 749	**2 286 749**
Total	**18 293 992**	**18 293 992**

Table 28 Estimated baseline emissions for 2013-2020

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

Parameter	Unit	2007	Total
Total GHG emissions reduction	tCO_2e	**58 280**	**58 280**

Table 29 Total GHG emissions reduction for 2007

Year	Total GHG emissions reduction (tons of CO_2 equivalent)
2008	**153 230**
2009	**1 034**
2010	**102 865**
2011	**63 962**
2012	**63 962**
Total	**385 053**

Table 30 Total GHG emissions reduction for 2008-2012

Year	Total GHG emissions reduction (tons of CO_2 equivalent)
2013	**63 962**
2014	**63 962**
2015	**63 962**
2016	**63 962**
2017	**63 962**
2018	**63 962**
2019	**63 962**
2020	**63 962**
Total	**511 696**

Table 31 Total GHG emissions reduction for 2013-2020

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

Year	Estimated Project Emissions (tons CO_2 equivalent)	Estimated Leakage (tons CO_2 equivalent)	Estimated Baseline Emissions (tons CO_2 equivalent)	Estimated Emissions Reductions (tons CO_2 equivalent)
Year 2007	1 761 820	0	1 820 100	58 280
Total (tons CO_2 equivalent)	**1 761 820**	**0**	**1 820 100**	**58 280**

Table 32 Estimated balance of emissions under the proposed project for 2007

Year	Estimated Project Emissions (tons CO_2 equivalent)	Estimated Leakage (tons CO_2 equivalent)	Estimated Baseline Emissions (tons CO_2 equivalent)	Estimated Emissions Reductions (tons CO_2 equivalent)
Year 2008	1 877 166	0	2 030 396	153 230
Year 2009	1 827 621	0	1 828 655	1 034
Year 2010	2 235 006	0	2 337 871	102 865
Year 2011	2 222 787	0	2 286 749	63 962
Year 2012	2 222 787	0	2 286 749	63 962
Total (tons CO_2 equivalent)	**10 385 367**	**0**	**10 770 420**	**385 053**

Table 33 Estimated balance of emissions under the proposed project for 2008-2012

Year	Estimated Project Emissions (tons CO_2 equivalent)	Estimated Leakage (tons CO_2 equivalent)	Estimated Baseline Emissions (tons CO_2 equivalent)	Estimated Emissions Reductions (tons CO_2 equivalent)
Year 2013	2 222 787	0	2 286 749	63 962
Year 2014	2 222 787	0	2 286 749	63 962
Year 2015	2 222 787	0	2 286 749	63 962
Year 2016	2 222 787	0	2 286 749	63 962
Year 2017	2 222 787	0	2 286 749	63 962
Year 2018	2 222 787	0	2 286 749	63 962
Year 2019	2 222 787	0	2 286 749	63 962
Year 2020	2 222 787	0	2 286 749	63 962
Total (tons CO_2 equivalent)	**17 782 296**	**0**	**18 293 992**	**511 696**

Table 34 Estimated balance of emissions under the proposed project for 20013-2020

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 Host Party for this project is Ukraine. Environmental Impact Assessment (EIA) is the part of the Ukrainian project planning and permitting procedures. Implementation regulations for EIA are included in the Ukrainian State Construction Standard DBN A.2.2.-1-2003[20], full EIA should be carried out for those types of activities and facilities that are highly hazardous, and are found in Appendix E of the DBN. The project activity is not subject to those activities, which are described in Appendix E of the DBN. In this case, the project was not associated with negative impact on the environment; however, the impact is assessed as positive. Implementation of the project does not contradict any of the laws, agreements and Environment codes ratified by Ukraine and listed in Appendix E of the DBN. Thus, it was not necessary to carry out the EIA of the project activity.

The analysis of the influence analysis of the project "Implementation of energy saving measures at PJSC "Ingulets iron ore enrichment works" on the environment is provided below:

P JSC "Ingulets iron ore enrichment works" operates a large amount of electrical equipment, most of which is obsolete and has low energy-saving features. The project activity provides modernization of existing electrical equipment, optimization of the operation mode, introduction of new equipment and systems, which lead not only to reduction of energy consumption, but also to decreasing the cost of auxiliary components such as metal parts, oil, coolant, service water. Thus, due to the project activity, the use of electrical equipment results in less impact on the environment.

Transboundary impact

Taking into account the fact that the project has no negative impact on water resources or increases emissions of harmful substances in the surface layers of the atmosphere, and the fact that the distance to the nearest boundary is more than 300 km (from Kryvyi Rih to the border with Moldova or more than 300 km), it was concluded that the project does not have transboundary impact.

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:

The project of modernization associated with a significant reduction of energy consumption from sources due to the modern and environment-friendly technologies, it has a positive impact on the ecology and environment. No negative consequences will be associated with the implementation of the project.

Environmental effects of the project described in Section F.1.

[20] *State Construction Standard DBN A.2.2.-1-2003 :"Structure and Contents of the Environmental Impact Assessment Report (EIR) for Designing and Construction of Production Facilities, Buildings and Structures"* State Committee Of Ukraine On Construction And Architecture, 2004

SECTION G. Stakeholders' comments

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

Implementation of the project does not pose an environmental hazard and carries a negative environmental impact; therefore, in accordance with the relevant rules of the host Party, there was no requirement to inform stakeholders. Their comments will be collected during the time of this PDD publication in the internet during the determination procedure.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organisation:	Public Joint Stock Company "Ingulets iron ore enrichment works"
Street/P.O.Box:	Rudna Str.
Building:	47
City:	Ktyvyi Rih
State/Region:	Dnipropetrovsk Region
Postal code:	50064
Country:	Ukraine
Phone:	+38 (056) 407-63-09
Fax:	+38 (056) 407-63-11
E-mail:	info@ingok.com.ua
URL:	http://ingok.metinvestholding.com/ua
Represented by:	
Title:	General director
Salutation:	Mr.
Last name:	Levitsky
Middle name:	Pavlovych
First name:	Andriy
Department:	
Phone (direct):	+38 (056) 407-63-09
Fax (direct):	+38 (056) 407-63-11
Mobile:	-
Personal e-mail:	-
EDRPOU code:	00190905
KVED types of economic activities:	07.10 Mining of iron ores; 85.32 Vocational Education; 46.72 Wholesale of metals and metal ores; 49.39 Other passenger land transport, n.e.o.g 55.90 Activities of other means of temporary accommodation 38.32 Recovery of sorted waste

Organisation:	Metinvest International SA
Street/P.O.Box:	rue Vallin
Building:	2
City:	Geneva
State/Region:	
Postal code:	1201
Country:	Switzerland
Phone:	+41 22 906 18 28
Fax:	+41 22 906 18 29
E-mail:	info@metinvestholding.com
URL:	http://sales.metinvestholding.com/en/contacts/misa
Represented by:	
Title:	General director
Salutation:	Mr.
Last Name:	Maksymovych
Middle Name:	
First Name:	Marian
Department:	
Phone (direct):	+41 22 906 18 28
Fax (direct):	+41 22 906 18 29
Mobile:	
Personal e-mail:	info@metinvestholding.com

ANNEX 2

BASELINE INFORMATION

In order to calculate the baseline emissions JI specific approach was used in accordance with the "Guidance on criteria for baseline setting and monitoring" version 03.

Key information and data used to create a baseline below in tabular form:

Data/Parameter	$P_{iron,y}$
Data unit	t
Description	Production of iron ore concentrate in period *y*
Time of determination/monitoring	Measured continuously
Source of data (to be) used	Project owner records
Value of data applied (for ex ante calculations/determinations)	Set ex-post during monitoring
Justification of the choice of data or description of measurement methods	Calculated in accordance with accepted company's policy
QA/QC procedures (to be) applied	Measurement of this parameter is performed with specialized equipment that runs regular calibration and verification. Involved staff is qualified to perform monitoring
Any comment	No

Data/Parameter	$SEC_{BL,iron}$
Data unit	MWh/t
Description	Specific consumption of electricity for production of iron ore concentrate in baseline scenario
Time of determination/monitoring	Fixed during the development phase of the project
Source of data (to be) used	Project owner records
Value of data applied (for ex ante calculations/determinations)	0.1486
Justification of the choice of data or	Accepted on the basis of historical data

description of measurement methods	
QA/QC procedures (to be) applied	In accordance with accepted standards of project owner
Any comment	For more detail information refer to Annex 2

Data/Parameter	$EF_{EL,grid,y}$
Data unit	tCO_2/MWh
Description	Specific indirect carbon dioxide emission factor from electricity consumption by the 1st class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052 in period *y*
Time of determination/monitoring	Annually
Source of data (to be) used	Orders or data from DFP of Ukraine or other competent studies (data for 2008-2011 are available in orders by National Environmental Investment Agency of Ukraine (Order # 62 dated 15/04/2011, Order # 63 dated 15/04/2011, Order # 43 dated 28/03/2011, Order # 75 dated 12/05/2011; data for 2007 is available in the study Standardized emission factors for the Ukrainian electricity grid)
Value of data applied (for ex ante calculations/determinations)	Determined during the monitoring
Justification of the choice of data or description of measurement methods	The calculation is made taking into account country-specific data for Ukraine
QA/QC procedures (to be) applied	In the absence of new values, the most recent values of specific indirect carbon dioxide emissions for electricity consumption will be used
Any comment	No

Table 35 Key information and data used to establish the baseline

GHG emissions in baseline scenario in period *y* are calculated as follows:

$$BE_y = BE_{EL,y}, \quad \textit{(Equation B-1)}$$

where:

BE_y - GHG emissions in baseline scenario in period *y*, tCO_2e;

$BE_{EL,y}$ - GHG emissions in baseline scenario from electricity consumption in period *y*, tCO_2e.

GHG emissions in baseline scenario from electricity consumption are in turn calculated as follows:

$$BE_{EL,y} = P_{iron,y} \times SEC_{BL,iron} \times EF_{EL,grid,y}, \quad \textit{(Equation B-2)}$$

where:

$BE_{EL,y}$ – GHG emissions in baseline scenario from electricity consumption in period *y*, tCO_2e;

$P_{iron,y}$ – Production of iron ore concentrate in period *y*, t;

$SEC_{BL,iron}$ – Specific consumption of electricity for production of iron ore concentrate in baseline scenario, MWh/t;
$EF_{EL,grid,y}$ – Specific indirect carbon dioxide emission factor from electricity consumption by the 1st class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052 in period *y,* tCO_2/MWh.

Determination of baseline parameters established in advance:

Specific electricity consumption for the production of iron ore concentrate in the baseline scenario:

Specific electricity consumption for the production of iron ore concentrate in the baseline scenario was calculated using the data for 2006, before the project implementation. This year has been one of the most typical years and reflects current practices of the equipment and the likely situation that would have occurred without the project.

Specific electricity consumption for the production of iron ore concentrate in the baseline scenario was calculated as follows:

$$SEC_{BL,iron}=EC_{BL,iron}/P_{BL,iron} \quad (Equation\ B\text{-}3)$$

where:

$SEC_{BL,iron}$ – Specific consumption of electricity for production of iron ore concentrate in baseline scenario, MWh/t;

$EC_{BL,iron}$ – Consumption of electricity for production of iron ore concentrate before project implementation, MWh;

$P_{BL,iron}$ – Production of iron ore concentrate before project implementation, t.

Parameter	Unit	Value
$SEC_{BL,iron}SEC_{BL,iron}$	MWh/t	0.1486
$EC_{BL,iron}EC_{BL,iron}$	MWh	1 933 333
$P_{BL,iron}P_{BL,iron}$	t	13 014 000

Table 36 Consumption of electricity and production of iron ore concentrate before project implementation

Standardized emission factors for the Ukrainian electricity grid

Introduction

Many Joint Implementation (JI) projects have an impact on the CO_2 emissions of the regional or national electricity grid. Given the fact that in most Economies in Transition (EIT) an integrated electricity grid exists, a standardized baseline can be used to estimate the amount of CO_2 emission reductions on the national grid in case of:

a) Additional electricity production and supply to the grid as a result of a JI project (= producing projects);
b) Reduction of electricity consumption due to the JI project resulting in less electricity generation in the grid (= reducing projects);
c) Efficient on-site electricity generation with on-site consumption. Such a JI project can either be a), b), or a combination of both (e.g. on-site cogeneration with partial on-site consumption and partial delivery to the grid).

So far most JI projects in EIT, including Ukraine, have used the standardized Emission Factors (EFs) of the ERUPT programme. In the ERUPT programme for each EIT a baseline for producing projects and reducing projects was developed. The ERUPT approach is generic and does not take into account specific local circumstances. Therefore in recent years new standardized baselines were developed for countries like Romania, Bulgaria, and Estonia. In Ukraine a similar need exist to develop a new standardized electricity baseline to take the specific circumstances of Ukraine into account. The following baseline study establishes a new electricity grid baseline for Ukraine for both producing JI projects and reducing JI projects.

This new baseline has been based on the following guidance and approaches:

- The "Guidance on criteria for baseline setting and monitoring" for JI projects, issued by the Joint Implementation Supervisory Committee[21];
- The "Operational Guidelines for the Project Design Document", further referred to as ERUPT approach or baseline [22];
- The approved CDM methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" [23];
- Specific circumstances for Ukraine as described below.

ERUPT

The ERUPT baseline was based on the following main principles:

- Based mainly on indirect data sources for electricity grids (i.e. IEA/OECD reports);
- Inclusion of grid losses for reducing JI projects;
- An assumption that all fossil fuel power plants are operating on the margin and in the period of 2000-2030 all fossil fuel power plants will gradually switch to natural gas.

The weak point of this approach is the fact that the date sources are not specific. For example, the Net Calorific Value (NCV) of coals was not determined on installation level but was taken from IPCC default values. Furthermore the IEA data included electricity data until 2002 only. ERUPT assumes that Ukraine would switch all its fossil-fuel plant from coal to natural gas. In Ukraine such an assumption is unrealistic as the tendency is currently in the opposite direction.

[21] Guidance on criteria for baseline setting and monitoring, version 01, Joint Implementation Supervisory Committee, ji.unfccc.int

[22] Operational Guidelines for Project Design Documents of Joint Implementation Projects. Ministry of Economic Affairs of the Netherlands, May 2004

[23] Consolidated baseline methodology for grid-connected electricity generation from renewable sources, version 06, 19 May 2006, cdm.unfccc.int

ACM0002
The ACM0002 methodology was developed in the context of CDM projects. The methodology takes a combination of the Operating Margin (OM) and the Build Margin (BM) to estimate the emissions in absence of the CDM project activity. To calculate the OM four different methodologies can be used. The BM in the methodology assumes that recent built power plants are indicative for future additions to the grid in the baseline scenario and as a result of the CDM project activity construction of new power plants is avoided. This approach is valid in electricity grids in which the installed generating capacity is increasing, which is mostly the case in developing countries. However, the Ukrainian grid has a significant overcapacity and many power plants are either operating below capacity or have been moth-balled.

Nuclear is providing the base load in Ukraine
In Ukraine nuclear power plants are providing the base load of the electricity in Ukraine. To reduce the dependence on imported fuel the nuclear power plants are running at maximum capacity where possible. In the past five years nuclear power plants provide almost 50% of the total electricity:

Year	2001	2002	2003	2004	2005
Share of AES	44%	45%	45%	48%	48%

Table 1 Share of nuclear power plant in the annual electricity generation

All other power stations are operating on the margin. This includes hydro power plants which is show in the table below.

	Minimum; 03:00	Maximum; 19:00
Consumption, MW	21 287	27 126
Generation, MW	22 464	28 354
Thermal power plants	10 049	13 506
Hydro power plants	527	3 971
Nuclear power plants	11 888	10 877
Balance imports/export, MW	-1 177	-1 228

Table 2 Electricity demand in Ukraine on 31 March 2005[24]

Development of the Ukrainian electricity sector
The National Energy Strategy[25] sets the approach for the overall energy complex of Ukraine and the electricity sector in particular. The main priority of Ukraine is to reduce the dependence of imported fossil fuels. The strategy sets the following priorities[26]:

- increased use of local coal as a fuel;
- construction of the new nuclear power plants;
- energy efficiency and energy saving.

Due to the sharp increase of imported natural gas prices a gradual switch from natural gas to coal at the power plants is planned in the nearest future. Ukraine possesses a large overcapacity of the fossil-powered plants of which many are mothballed. These moth-balled plants might be connected to the grid in case of growing demand.

[24] Ukrenergo, http://www.ukrenergo.energy.gov.ua/ukrenergo/control/uk/publish/article?art_id=39047&cat_id=35061

[25] http://mpe.kmu.gov.ua/fuel/control/uk/doccatalog/list?currDir=50505

[26] Energy Strategy of Ukraine for the Period until 2030, section 16.1, page 127.

In the table below the installed capacity and load factor is given in Ukraine. As one can see the average load factor of thermal power plant is very low.

	Installed capacity (GW)	Average load factor, %
Thermal power plants	33.6	28.0
Hydro power plants	4.8	81.4
Nuclear power plants	13.8	26.0
Total	**52.2**	**39.0**

Table 3 Installed capacity in Ukraine in 2004[27]

According to IEA's estimations, about 25% of thermal units might not be able to operate (though there is no official statistics). This means that still at least 45% of the installed thermal power capacity could be utilized, but is currently not used. In accordance with the IEA report the 'current capacity will be sufficient to meet the demand in the next decade'[28].

In the table below the peak load of the years 2001- 2005 are given which is approximately 50% of the installed capacity.

	2001	2002	2003	2004	2005
Peak load (GW)	28.3	29.3	26.4	27.9	28.7

Table 4 Peak load in Ukraine in 2001 - 2005[29]

New nuclear power plants will take significant time to be constructed will not get on-line before the end of the second commitment period in 2012. There is no nuclear reactor construction site at such an advanced stage remaining in Ukraine, it is unlikely that Ukraine will have enough resources to commission any new nuclear units in the foreseeable future (before 2012)[30].

Latest nuclear additions (since 1991):
- Zaporizhzhya NPP unit 6, capacity 1 GW, commissioned in 1995;
- Rivne NPP unit 4, capacity 1 GW, commissioned in 2004;
- Khmelnitsky NPP unit 2, capacity 1 GW, commissioned in 2004.

Nuclear power plants under planning or at early stage of construction:
- South Ukraine NPP one additional unit, capacity 1 GW;
- Khmelnitsky NPP two additional units, capacity 1 GW each.

Approach chosen
In the selected approach of the new Ukrainian baseline the BM is not a valid parameter. Strictly applying BM in accordance with ACM0002 would result in a BM of zero as the latest additions to the Ukrainian grid were nuclear power plants. Therefore applying BM taking past additions to the Ukrainian grid would result in an unrealistic and distorted picture of the emission factor of the Ukrainian grid. Therefore the Operating Margin only will be used to develop the baseline in Ukraine.

[27] Source: Ukraine Energy Policy Review. OECD/IEA, Paris 2006. p. 272, table 8.1

[28] Source: Ukraine Energy Policy Review. OECD/IEA, Paris 2006. p. 269

[29] Ministry of Energy, letter dated 11 January 2007

[30] http://www.xaec.org.ua/index-ua.html

The following assumptions from ACM0002 will be applied:

1) The grid must constitute of all the power plants connected to the grid. This assumption has been met as all power plants have been considered;
2) There should be no significant electricity imports. This assumption has been met in Ukraine as Ukraine is a net exporting country as shown in the table below;
3) Electricity exports are not accounted separately and are not excluded from the calculations.

	2001	2002	2003
Electricity produced, GWh	175 109	179 195	187 595
Exports, GWh	5 196	8 576	12 175
Imports, GWh	2 137	5 461	7 235

Table 5 Imports and exports balance in Ukraine[31]

ACM0002 offers several choices for calculating the OM. Dispatch data analysis cannot be applied, since the grid data is not available[32]. Simple adjusted OM approach is not applicable for the same reason. The average OM calculation would not present a realistic picture and distort the results, since nuclear power plants always work in the base load due to the technical limitations (and therefore cannot be displaced) and constitute up to 48% of the overall electricity generation during the past 5 years.

Therefore, the simple OM approach is used to calculate the grid emission factor. In Ukraine the low-cost must-run power plants are nuclear power stations. Their total contribution to the electricity production is below 50% of the total electricity production. The remaining power plants, all being the fossil-fuel plants and hydro power plants, are used to calculate the Simple OM.

%	2001	2002	2003	2004	2005
Nuclear power plants	44.23	45.08	45.32	47.99	47.92
Thermal power plants	38.81	38.32	37.24	32.50	33.22
Combined heat and power	9.92	11.02	12.28	13.04	12.21
Hydro power plants	7.04	5.58	5.15	6.47	6.65

Table 6 Share of power plants in the annual electricity generation of Ukraine[33]

[31] Source: State Committee of Statistics of Ukraine. Fuel and energy resources of Ukraine 2001-2003. Kyiv, 2004

[32] Ministry of Energy, letter dated 11 January 2007

[33] "Overview of data on electrical power plants in Ukraine 2001 - 2005", Ministry of Fuel and Energy of Ukraine, 31 October 2006 and 16 November 2006.

The simple OM is calculated using the following formula:

$$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum GEN_{j,y}} \qquad \text{(Equation -1)}$$

Where:

$F_{i,j,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year(s) *y* (2001-2005);

j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid;

$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel *I* (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in year(s) *y*;

$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source *j*.

The CO_2 emission coefficient $COEF_i$ is obtained as:

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \qquad \text{(Equation 2)}$$

Where:

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel *i*;

$OXID_i$ is the oxidation factor of the fuel;

$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i*.

Individual data for power generation and fuel properties was obtained from the individual power plants[34]. The majority of the electricity (up to 95%) is generated centrally and therefore the data is comprehensive[35].

The Net Calorific Value (NCV) of fossil fuel can change considerably, in particular when using coal. Therefore the local NCV values of individual power plants for natural gas and coal were used. For heavy fuel oil, the IPCC[36] default NCV was used. Local CO_2 emission factors for all types of fuels were taken for the purposes of the calculations and Ukrainian oxidation factors were used. In the case of small-scale power plants some data regarding the fuel NCV is missing in the reports. For the purpose of simplicity, the NCV of similar fuel from a power plant from the same region of Ukraine was used.

Reducing JI projects

The Simple OM is applicable for additional electricity production delivered to the grid as a result of the project (producing JI projects). However, reducing JI projects also reduce grid losses. For example a JI project reduces on-site electricity *consumption* with 100,000 MWh and the losses in the grid are 10%. This means that the actual reduction in electricity *production* is 111,111 MWh. Therefore a reduction of

[34] "Overview of data on electrical power plants in Ukraine 2001 - 2005", Ministry of Fuel and Energy of Ukraine, 31 October 2006 and 16 November 2006.

[35] The data for small units (usually categorized in the Ukrainian statistics as 'CHPs and others') is scattered and was not always available. As it was rather unrealistic to collect the comprehensive data from each small-scale power plant, an average CO2 emission factor was calculated for the small-scale plants that provided the data. For the purpose of simplicity it was considered that all the electricity generated by the small power plants has the same average emission factor obtained.

[36] IPCC 1996. Revised guidelines for national greenhouse gas inventories.

these grid losses should be taken into account for reducing JI projects to calculate the actual emission reductions.

The losses in the Ukrainian grid are given in the table below and are based on the data obtained directly from the Ukrainian power plants through the Ministry of Energy.

Year	Technical losses %	Non-technical losses %	Total %
2001	14.2	7	21.2
2002	14.6	6.5	21.1
2003	14.2	5.4	19.6
2004	13.4	3.2	16.6
2005	13.1	1.6	14.7

Table 7 Grid losses in Ukraine[37]

As one can see grid losses are divided into technical losses and non-technical losses. For the purpose of estimating the EF only technical losses[38] are taken into account. As can been seen in the table the technical grid losses are decreasing. The average decrease of grid losses in this period was 0.275% per annum. Extrapolating these decreasing losses to 2012 results in technical grid losses of 12% by 2012. However, in order to be conservative the grid losses *over the full period 2006-2012* have been taken as 10%.

Further considerations

The "Guidance on criteria for baseline setting and monitoring" for JI projects requires baselines to be conservative. The following measures have been taken to adhere to this guidance and to be conservative:

- The grid emission factor is actually expected to grow due to the current tendency to switch from gas to coal;
- Hydro power plants have been included in the OM. This is conservative;
- With the growing electricity demand, out-dated mothballed fossil fired power plants are likely to come on-line as existing nuclear power plants are working on full load and new nuclear power plants are unlikely to come on-line before 2012. The emission factor of those moth-balled power plants is higher as all of them are coal of heavy fuel oil fired[39];
- The technical grid losses in Ukraine are high, though decreasing. With the current pace the grid losses in Ukraine will be around 12% in 2012. To be conservative the losses have been taken 10%;
- The emissions of methane and nitrous oxide have not taken into consideration, which is in line with ACM0002. This is conservative.

Conclusion

An average CO_2 emission factor was calculated based on the years 2003-2005. The proposed baseline factors is based on the average constituting a fixed emission factor of the Ukrainian grid for the period of 2006-2012. Both baseline factors are calculated using the formulae below:

$$EF_{grid,produced\,y} = EF_{OM,y} \qquad \text{(Equation 3)}$$

[37] "Overview of data on electrical power plants in Ukraine 2001 - 2005", Ministry of Fuel and Energy of Ukraine, 31 October 2006 and 16 November 2006.

[38] Ukrainian electricity statistics gives two types of losses – the so-called 'technical' and 'non-technical'. 'Non-technical' losses describe the non-payments and other losses of unknown origin.

[39] "Overview of data on electrical power plants in Ukraine 2001 - 2005", Ministry of Fuel and Energy of Ukraine, 31 October 2006 and 16 November 2006.

and

$$EF_{grid,reduced,y} = \frac{EF_{grid,produced,y}}{1 - loss_{grid}} \qquad \text{(Equation 4)}$$

Where:

$EF_{grid,produced,y}$ is the emission factor for JI projects supplying additional electricity to the grid (tCO_2/MWh);
$EF_{grid,reduced,y}$ is the emission factor for JI projects reducing electricity consumption from the grid (tCO_2/MWh)factor of the fuel;
$EF_{OM,y}$ is the simple OM of the Ukrainian grid (tCO_2/MWh);
$loss_{grid}$ is the technical losses in the grid (%).

The following result was obtained:

Type of project	Parameter	EF (tCO2/MWh)
JI project producing electricity	$EF_{grid,produced,y}$	0.807
JI projects reducing electricity	$EF_{grid,reduced,y}$	0.896

Table 8 Emission Factors for the Ukrainian grid 2006 - 2012

Monitoring

This baseline requires the monitoring of the following parameters:

- Electricity produced by the project and delivered to the grid in year *y* (in MWh);
- Electricity consumption reduced by the project in year (in MWh);
- Electricity produced by the project and consumed on-site in year *y* (in MWh);

The baseline emissions are calculated as follows:

$$BE_y = EF_{grid,produced,y} x EL_{produced,y} + EF_{grid,reduced,y} x \left(EL_{reduced,y} + EL_{consumed,y} \right) \qquad \text{(Equation 5)}$$

Where:

BE_y are the baseline emissions in year *y* (tCO_2);
$EF_{grid,produced,y}$ is the emission factor of producing projects (tCO_2/MWh);
$EL_{produced,y}$ is electricity produced and delivered to the grid by the project in year *y* (MWh);
$EF_{grid,reduced,y}$ is the emission factor of reducing projects (tCO_2/MWh);
$EL_{produced,y}$ is electricity consumption reduced by the project in year *y*(MWh);
$EL_{consumed,y}$ is electricity produced by the project and consumed on-site in year *y* (MWh).

This baseline can be used as ex-ante (fixed for the period 2006 – 2012) or ex-post. In case an ex-post baseline is chosen the data of the Ukrainian grid have to be obtained of the year in which the emission reductions are being claimed. Monitoring will have to be done in accordance with the monitoring plan of ACM0002 with the following exceptions:

- the Monitoring Plan should also include monitoring of the grid losses in year *y*;
- power plants at which JI projects take place should be excluded. Such a JI project should have been approved by Ukraine and have been determined by an Accredited Independent Entity.

Acknowledgements

The development of this new baseline has been made possible by funding of the EBRD and the Netherlands' Ministry of Economic Affairs. The authors would further like to thank the Ukrainian Ministry of Energy for supplying the data and the Ministry of Environmental Protection for their support. This baseline study can be used freely in case of proper reference.
Global Carbon B.V.
Version 5, 2 February 2007

Industrie Service

Choose certainty.
Add value.

Ukraine - Assessment of new calculation of CEF

Introduction

Many Joint Implementation (JI) projects have an impact on the CO_2 emissions of the regional or national electricity grid. Given the fact that in most Economies in Transition an integrated electricity grid exists, a standardized baseline should be used to estimate the amount of CO_2 emission reductions on the national grid.

The Ukraine is one of the major JI host countries where many grid related projects have been developed or will be implemented. In order to enhance the project development and reliability in emission reductions from the Ukraine a standardized and common agreed grid factor expressing the carbondioxid density per kWh is crucial.

Objective

Global Carbon B.V. is one of the pioneers developing JI projects in Ukraine who has developed a baseline approach for determining the Ukrainian grid factor. The approach is implied from the approved CDM methodology ACM0002.

The team of Carbon Management Service (CMS) of TÜV SÜD Industrie Service GmbH with its accredited certification body "Climate and Energy" has been ordered to verify the developed approach and the calculated grid factor.

Once an approach is agreed it should be used for calculating the grid by using current available data served from the Ukraine Ministry for Fuel and Energy. Such annual grid factor shall be used as a binding grid factor for JI projects developed in the Ukraine.

Scope

The baseline approach to which this confirmation is referring is attached. The confirmation includes the inherent approach if the algorithms are developed reasonable and from a technical point of view correct. Furthermore the verified the

Date: 17.08.2007

Our reference:
IS-USC-MUC/

This document consists of
4 Pages
Page 1 of 4

The test results refer exclusively to the units under test.

Headquarters: Munich
Trade Register: Munich HRB 96 869

Supervisory Board:
Dr. Axel Stepken (Chairman)
Board of Management:
Dr. Manfred Bayerlein (Spokesman)
Dr. Udo Heisel

Telefon: +49 89 5791-0
Telefax:
www.tuev-sued.de

TÜV SÜD Industrie Service GmbH
Carbon Management Service
Westendstrasse 199
80686 Munich
Germany

Annex 3

MONITORING PLAN

For the monitoring plan please refer to section D of this PDD.