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

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

Title: "Energy efficiency investment program at OJSC ArcelorMittal Steel Kryviy Rih".

PDD version: 04, dated 04 August 2009

The project title was slightly changed if compared with the PDD (version 01) published on UNFCCC website for comments[1]. Between the two PDD versions the Ukrainian steel complex "Kryvorizhstal" has been acquired by ArcelorMittal and subsequently the former name was changed from "Mittal Steel Kryviy Rih" to "ArcelorMittal Steel Kryviy Rih" in June 2006. In order to be consistent, the PDD name has been modified accordingly.

A.2. Description of the project:

The aim of the project

This Project Design document (hereinafter "PDD") is provided for the purpose of the registration of an Energy Efficiency Investment Programme ("EEIP) at integrated steel complex of ArcelorMittal Kryviy Rih ("AMKR", or the "Company") in Ukraine, as a Joint Implementation ("JI") project, under Art.6 of the Kyoto Protocol (KP).

The project concept

For ArcelorMittal, energy efficiency and optimization is an effective lever for minimizing impacts on the environment and improving its operational processes and consumption. The total potential for consumption reduction, based on all the plants reaching benchmark performance, represents 10% of the specific consumption i.e. 2 MBTUs (million British Thermal Units) per ton of liquid steel.

A fully dedicated team within the company has developed energy efficiency assessments in 22 major plants, enabling the identification and validation of the key actions to be implemented, mainly to reduce natural gas and electricity consumption. Main areas of action are gas reallocation and optimization through the management of power plants and energy flows.

Most of these projects will also contribute to the reduction of CO_2 emissions which is part of AM long-term CO_2 strategy.

In Kryviy Rih, Ukraine, the energy efficiency assessment has identified 8 key measures that will be implemented before 2012 to reduce electricity and natural gas consumption and increase the efficiency of power usage hence reducing carbon emissions.

Expected results

The proposed JI project envisages the implementation of eight sub-projects to increase the energy effectiveness of complex's operations. The estimated total investment is of around 102 million USD.

[1] Title: "Energy efficiency investment program at Mittal Steel Kryviy Rih" ("the Project") - PDD version: 01, dated 23 July 2007.

Sub project	UAH	USD(*)
1. Modernization of Air Separating Unit:	142,000,000	27,949,206
2. Modernization of Compressors station	28,000,000	5,511,111
3. Switch fuel from NG to COG+BFG+NG mixtures	47,000,000	9,250,794
4. Refurbishment of Energy Distribution System	48,000,000	9,447,619
5. New Gas Burner Installation	17,500,000	3,444,444
6. Turbo Generators Installation	157,000,000	30,901,587
7. BF top recovery turbine installation	60,000,000	11,809,524
8. Heat recovery in Refractory and Lime Rotary Kilns	18,900,000	3,720,000
TOTAL	**518,400,000**	**102,034,286**

(*) based on exchange ratio of 0.1968 USD/UAH

Table 1: Energy Efficiency Investment Programme

The overall objective of the JI Project is to generate Emission Reduction Units (ERUs) by reducing about 1.6 million tonnes of CO_2 emissions before the end of 2012 by saving around 580 GWh of electricity and 35 Mln m^3 of NG per year.

The investment program is largely environmentally oriented; it will improve the efficiency in the use of resources and it will apply modern technologies.

Moreover, the implementation of this Project will offer a number of socio-economic impacts to the region as shortly described here below:

- Implementation of the project will lead to improvement of ecological climate to the region, prevent reduction of working places and improve working conditions;
- The investment will increase economic activity by use of local civil engineering and related contractors for the implementation of the project;
- The project will increase the overall resource efficiency and therefore will strengthen the market position of the company. This will increase the job security of the people directly or indirectly dependent on the plant.

ArcelorMittal investment in the Company is a landmark transaction for Ukraine and its transition to a market economy. It has the potential to demonstrate to other foreign investors the benefits arising from a transparent privatisation, successful restructuring and introduction of international business management practices. ERUs generation can stimulate improvements in reducing energy consumptions and improving environmental performance.

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)	OJSC ARCELOR MITTAL STEEL KRYVIY RIH 1, Ordzhonikidze Street, Kryviy Rih, 50095, UKRAINE	No
Luxembourg	ArcelorMittal Flat Carbon Europe S.A. Trade registry number: LUXBG B 2.050 19 avenue de la Liberté L-2930 Luxembourg	No
Luxembourg	ArcelorMittal Long Carbon Europe S.A. 19 avenue de la Liberté L-2930 Luxembourg	No

Table 2: Project participants

OJSC ARCELOR MITTAL STEEL KRYVIY RIH

ArcelorMittal Steel complex of Kryviy Rih is the largest Ukrainian steelworks. The Company is controlled by ArcelorMittal ("AM"), the world's number one steel company, with 320,000 employees in more than 60 countries. AM is currently listed under the legal entity "Mittal Steel NV" on the stock exchanges of New York, Amsterdam, Paris, Brussels, Luxembourg and on the Spanish stock exchanges of Barcelona, Bilbao, Madrid and Valencia.

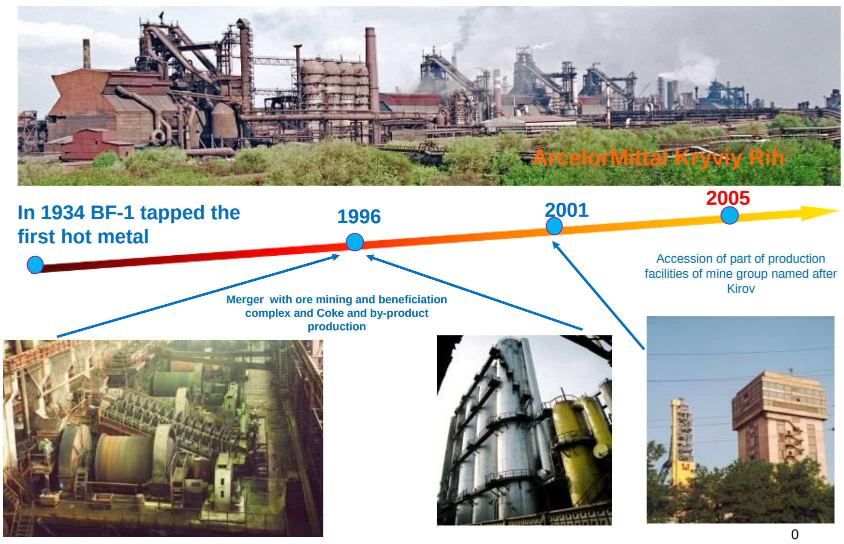


Figure 1: History of the enterprise

AMKR is a fully integrated steelworks producing long products, predominantly rebar and wire rod. In 2007 it produced about 8.1 million tonnes of liquid steel and 6.2 million tonnes of rolled products. AMKR currently employs 50,000 employees of which 37,000 people work in the steel plant and 13,000 people in the iron ore mines.

Figure 2: AMKR products

The complex currently operates the following main production units:

- The Mine Department, consisting of one open pit, two deep mines, crushing and sizing plants,
- The Mining and Beneficiation complex, consisting of only open pit mines, crushing and concentration facilities as well as sinter production plant,
- The Coke production plant, consisting of coal preparation, two coke oven units and the Recovery shop for chemicals production, and
- The Metallurgical Complex, consisting mainly of another sinter production plant, the Blast Furnaces shops, the steel making plants (both open hearth furnaces and converter types) and the Rolling shops.

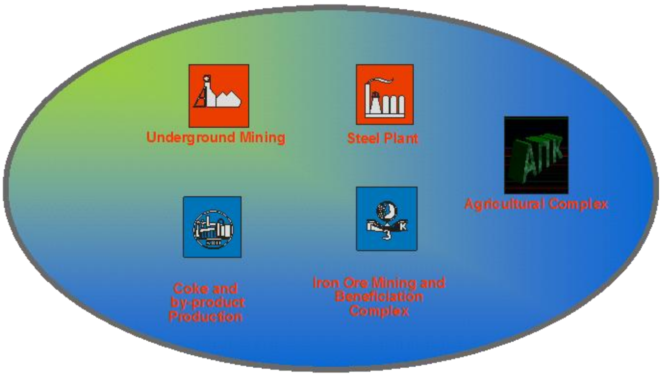
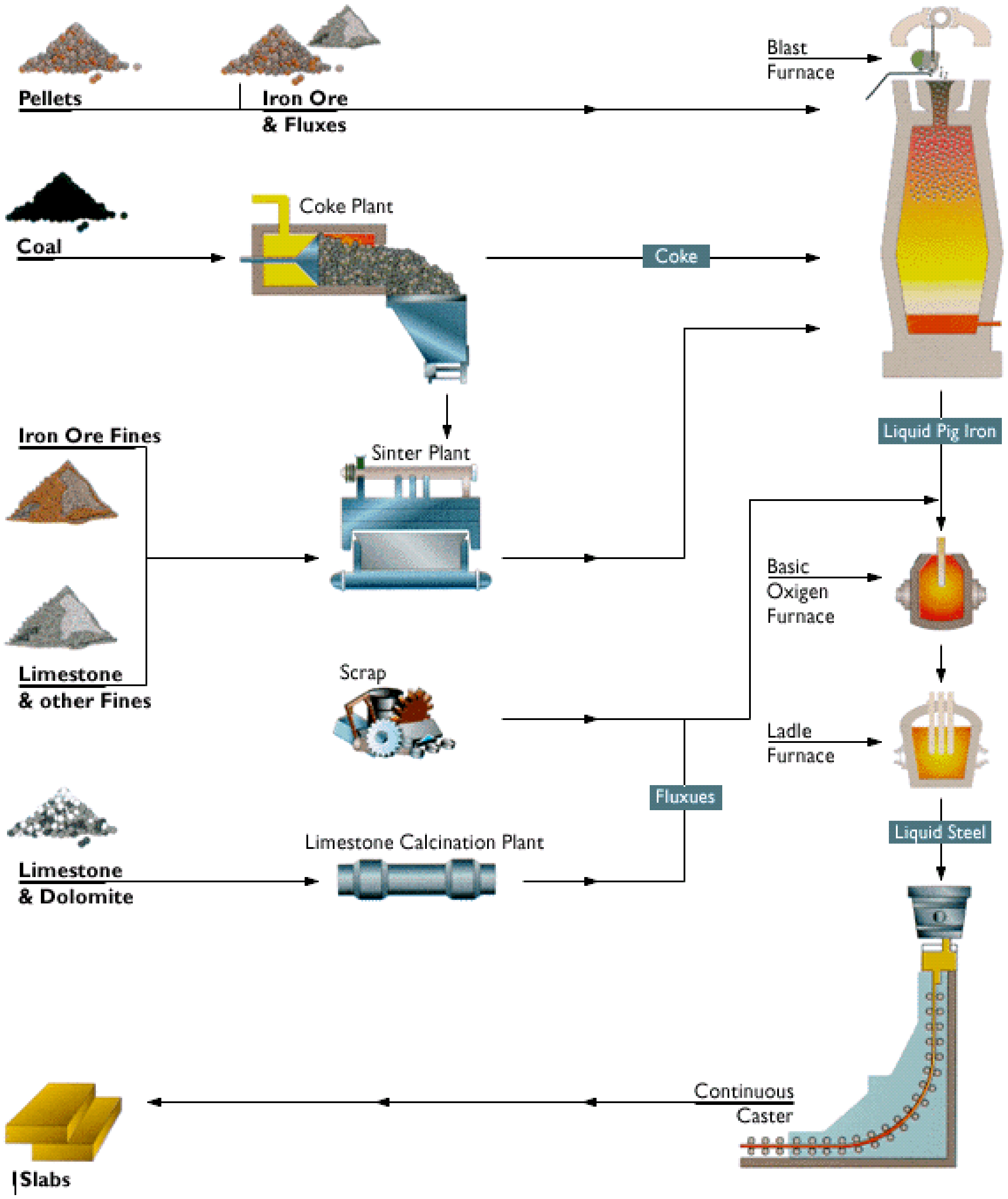


Figure 3: Open Joint Stock Company “ArcelorMittal Kryviy Rih

There are other important production units in operation for the production of other necessary materials, including the rotary and shaft kilns for the production of lime from limestone, the air separation units for the production of oxygen, the scrap preparation shop, the refractory production shop and the HPP plants. On average about 16 % of the electricity demand is supplied by the HPPs. The remaining is purchased from the Ukrainian National Grid.


Pellets
Iron Ore
& Fluxes
Blast
Furnace
Coal
Coke Plant
Coke
Iron Ore Fines
Sinter Plant
Liquid Pig Iron
Basic
Oxigen
Furnace
Limestone
& other Fines
Scrap
Ladle
Furnace
Fluxues
Liquid Steel
Limestone Calcination Plant
Limestone
& Dolomite
Continuous
Caster
Slabs

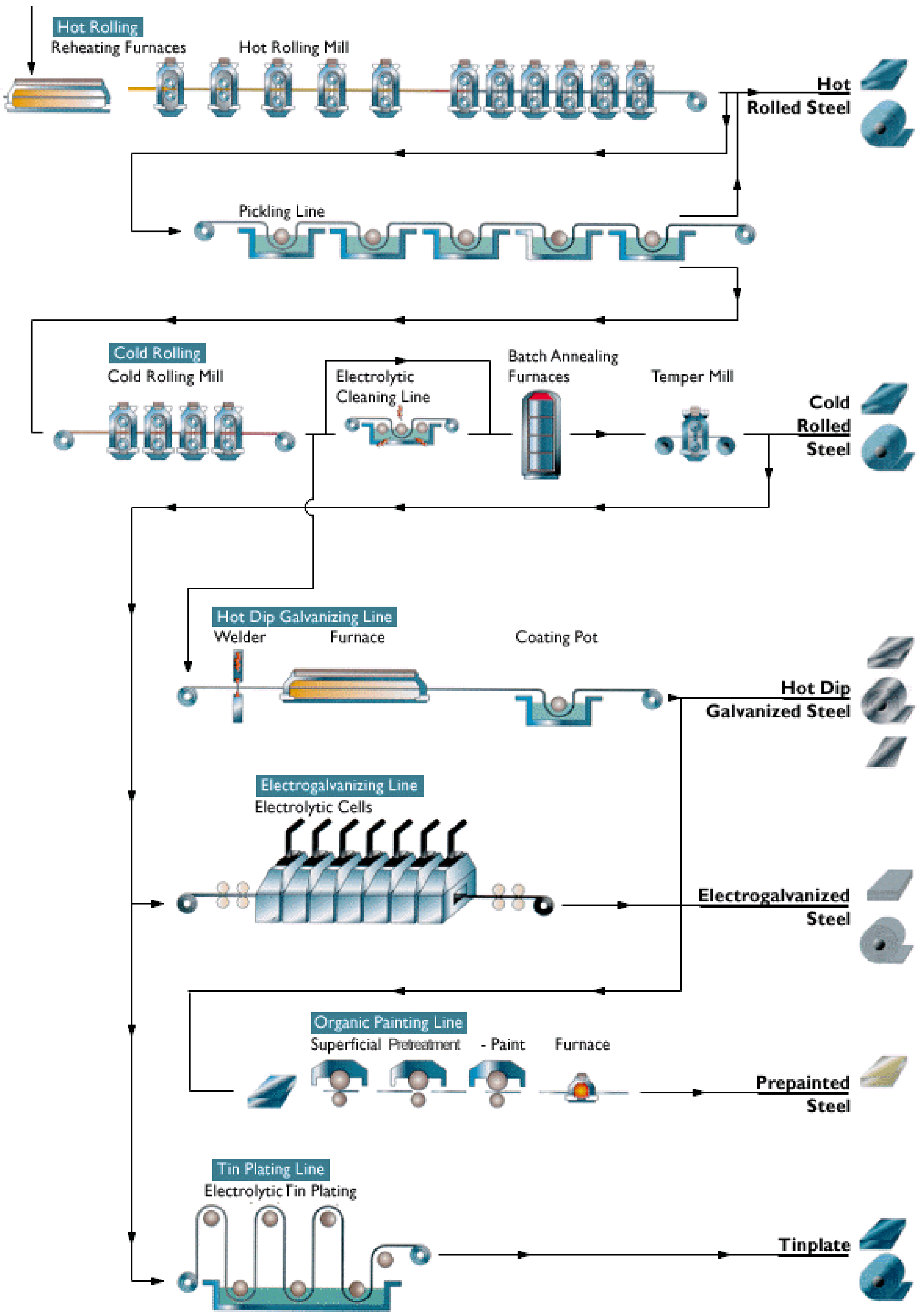


Figure 4: Production process at AMKR

The main energy carriers are electricity for the supply of electric motors, coal for the production of coke and for the metallurgical processes, and natural gas for the Blast furnaces, the Rolling shops, the lime rotary kilns and as a supplement to blast furnace and coke oven gases in heat and power generation. In 2007 the company has consumed of around 3.2 million tons of coal 3.5 million tons of coke, 5.06 TWh of electricity and 1.0 billion Nm3 of natural gas.

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.:

The AMKR steel facilities are situated at the outskirts of Kryviy Rih, a city of around 800,000 inhabitants in central Ukraine, approximately 400 km south of Kiev and 150 km southwest of Dnepropetrovsk (see figures below).

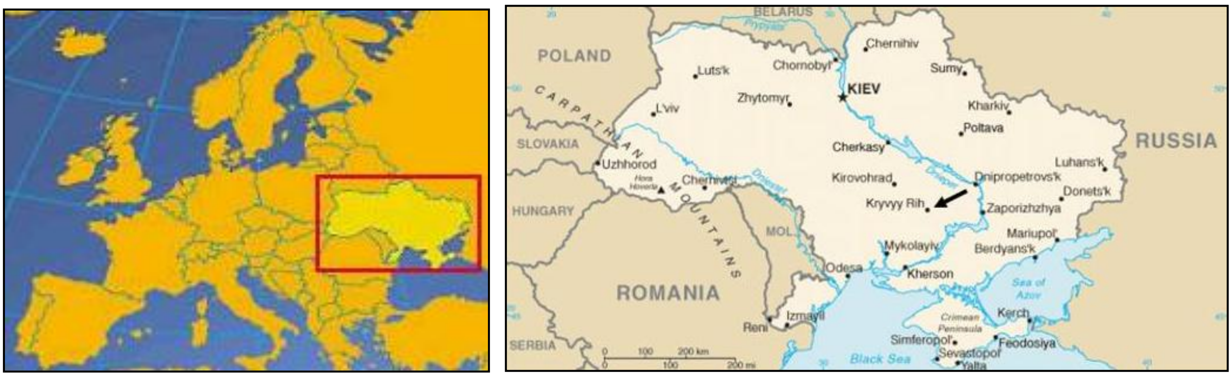


Figure 5: Site location

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

The city of Kryviy Rih.

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

Kryviy Rih is situated in Dnepropetrovsk Oblast in central Ukraine, to the southwest of the oblast's administrative centre, Dnepropetrovsk. Kryviy Rih is arguably the main steel industry city of the Eastern Europe, being a large globally important metallurgical centre in the Kryvbas iron-mining region.

There is a very long iron production history in the area. Modern time iron and steel production started in the 30's with the commissioning of the Blast Furnace No 1 in 1934. Gradually in the 50's and 60's more processing plants were built and in the 70's, the metallurgical complex was fully developed with the commissioning of the large Blast Furnace N°9 (5,000 m^3) and the Heat and Power Plant N°3. In the 90's, the integrated steel complex was formed with the inclusion of the mining and ore concentration complex and the coke production plant, while in 2001 the deep mining facilities were integrated into the complex of "Krivorizhstal".

In December 2005, Mittal Steel, the leading global steel group, acquired 93% of the share capital of "Krivorizhstal" and the company was renamed to Mittal Steel Kryviy Rih. On 25 June 2006 Mittal Steel merged with Arcelor to create the world's largest steel Company. Consequently, the company was renamed again to "ArcelorMittal steel Kryviy Rih".

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

In the following paragraphs, the technologies associated with the implementation of each Sub-Project are shortly described. Technology used is proven and therefore no major bottlenecks are expected with its implementation. In order the Project to be implemented, AM has assembled a team of experts from its global operations each of whom is specialized in a particular aspect of the project.

A.4.2.1 SP1 - Modernization of Air Separating Unit:

Context

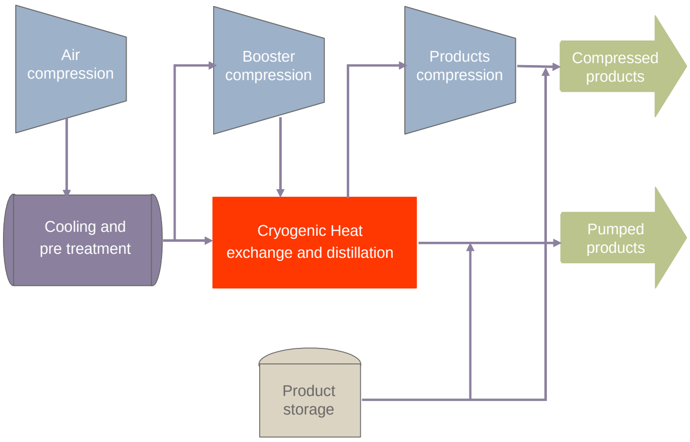


Figure 6: Cryogenic Air Separation Process Principles

The cryogenic air separation process begins with the intake of huge volumes of air from the atmosphere. The air is compressed and purified before entering the cryogenic equipment package. The air is cooled to about -300°F (-185°C) and then, relying on different boiling points, separated into its elemental components in the form of liquid oxygen, argon and nitrogen.

AMKR oxygen plant is composed of eight Air Separating Units for a total oxygen production of about 200,000 m^3/h per year.

Project description

The sub-project #1 consists in the installation of a new Air Separating Unit "AKAR-40/35". This new unit will permit to reduce specific consumption of compressed air for oxygen production from 6 m^3 to 5.04 m^3 of compressed air per 1 m^3 of oxygen if compared with the current units. New Air Separating Unit will replace the one temporary shut down during the capital repair of the compressor (subproject 2). Upon completion of compressor repair, the new unit will replace ASU BR-2 #8 in Oxygen Shop#1. Total number of Units after project implementation will remain 8, since ASU BR-2 #8 will be shut down and used for spares. After completion of the project, old ASU BR-2 #8 will be shut down and used for spares. Obsolete equipment will be used as a training unit and a source of spare parts for operational units, e.g. compressors, etc

The new equipment will contain a new Air compression sub-unit, Cooling and pre-treatment, Booster compression, Cryogenic Heat Exchange and Distillation, Products compression (N2, Argon, O2).

Some more information about ASUs have been included in annex 2 to the present document.

As the air-compression process consumes electricity, this specific consumption reduction will result in electricity saving. Moreover, the installation of the new unit will guarantee back-up capacity to cover possible stops of the service, resulting in interruption of production.

It has to be noted that this sub-project is strictly connected to sub-project #2. Sub-project #2 foresees the increasing of air-compressors efficiency. In order to be conservative, the expected future value of 0.082 kWh consumption per each m^3 of compressed air produced has been used for baseline calculation.

Time schedule

The project was going to be completed before the end of March 2009. Due to the crisis and lack of financing, the execution of the project has been delayed for 1-2 years.

A.4.2.2 SP2 - Modernization of Compressors station

Context

Eight compressors are currently installed at the oxygen plant with the following operational parameters:

Parameters	
Compressor type	K-1500-62-2
Current capacity Q, m^3/min	1370
Current energy input N, kW	7400
Gear set drawing No	1464.425.СБ
Nominal load N, kW	9000

Table 3: Current K-1500 units operational parameters

Project description

In spite of the fact that current units are in good conditions and still workable, total of 8 Air Compressors will be refurbished in order to increase the energy efficiency of compressed air production.

The main operational parameters of the refurbished units are as follow:

Parameter	Units	Value
Volume capacity, reduced to initial conditions for suction	m^3/min	1700
Air final pressure, abs	MPa	0,736
Energy input	kW	8350

Table 4: Operational parameters after the refurbishment

The refurbishment will result in reduced specific electricity consumption for cubic meter of compressed air produced from the current 0.09 kWh/m^3 to 0.082 kWh/m^3.

The figure 0.09 kWh/m3 is generated by using the following parameters:

- current capacity Q, 1370m^3/min;
- current Energy input 7400KW.

The formulae is as such: 7400 (KW)/ 1370 (m^3/min)*60(min/hour) = 0.090 KWh/m^3

The figure 0.082KWh/m3 is generated by using the following parameters:

newly installed capacity Q, 1700m^3/min ;

Energy Input 8350KW.

The formulae is as such: 8350 (KW)/ 1700 (m3/min)*60(min/hour) = 0.082 KWh/m^3

In spite of the fact that the first two projects have some connection, it has to be underlined that there will be no risk of double counting during the monitoring phase. For project 1 the output is O_2, and the project will permit to reduce the specific electricity consumption to produce oxygen starting from compressed air. Project 2 output is compressed air, and the project will permit to reduce specific electricity consumption to produce compressed air. The only link between the projects is that thanks to the implementation of project 1 and the increasing of efficiency in the use of compressed air, project 2 can be implemented as one-by-one replacement of the compressors without loosing O_2, N_2, Argon production due to shutdown of one of the compressors

Time schedule

In order not to interfere with the compressed air demand of the processes, the eight compressors will be refurbished according to the following proposed planning:

August 2008	1 compressor
Jan 2009	2nd and 3rd compressor
Jan 2010	4th and 5th compressor
Jan 2011	6th and 7th
Jan 2012	8th

Table 5: Compressors' refurbishment programme

Due to the crisis and lack of financing, the execution of the project has been delayed for 1 year.

A.4.2.3 SP3 - Switch fuel from NG to COG+BFG+NG mixtures

Project description

The sub-projects consist in the partial replacement of natural gas with Blast Furnace Gas and Coke Oven Gas by installing and connecting new pipelines of mixing and boosting stations, and replacing nozzles of burners of two mills of Rolling shop.

The plant and its infrastructure had been designed for Natural Gas only. In order to use the new mixture of gas with consequent reduction of calorific value, some modifications of equipment are required: to replace burners in rolling shop #3 in order to allow lower calorific value gases to be combusted in the reheat furnaces, and to develop infrastructure – pipeline and mixing/boosting stations.

The heat content associated to the use of waste gases would be lost into the atmosphere without the implementation of this project. The sub-project consists in the following actions:

a) Replacement of NG by COG+BFG+NG mixture for the heating of reheating furnaces of Rolling Shop 3;

b) Switch from NG to NG+BFG mixture in refractory and Lime Rotary kilns.

Time schedule

The sub-project is going to be completed before end of June 2008. Due to the crisis and lack of financing, the execution of the project has been delayed for 1-2 years.

A.4.2.4 SP4 - Refurbishment of Electricity Distribution System

Context

In current transmission lines, the inductance and capacitance of the line conductors can be significant. The currents that flow in these components of transmission line impedance constitute reactive power, which transmits no energy to the load. Reactive current flow causes extra losses in the transmission circuit. The ratio of real power (transmitted to the load) to apparent power is the "power factor" (cosφ).

The power factor is by definition a dimensionless number between 0 and 1. When power factor is equal to 0, the energy flow is entirely reactive. When the power factor is 1, all the energy supplied by the source is consumed by the load. As reactive current increases, the reactive power increases and the power factor decreases. For systems with low power factors, losses are higher than for systems with high power factors. For instance, to get 1 kW of real power at 0.2 power factor, 5 kVA of apparent power needs to be transferred (1 kW ÷ 0.2 = 5 kVA). This apparent power must be produced and transmitted to the load in the conventional fashion, and is subject to the usual distributed losses in the production and transmission processes.

The major component of power loss is due to ohmic losses in the conductors and is proportional to the product of the resistance of the wire and the square of the current:

$$P_{Losses} \propto RI^{2}$$ [2]

Where:

P_{losses}= Power losses on the wire;

R= resistance of the wire;

I= Current

The reduction of the power factor would lead to decreasing of current required to pass through the wire and consequently reducing the power losses with a square relation.

At AMKR site the electricity is provided by 25 High Voltage ("HV") substations. From the HV substations, the distribution network provides electricity to all production plants through local substations consisting of several transformers with varying capacity. The main consumers of reactive electric power are: Blooming -1; Section Rolling Shop-1(substations KRZ-3, KRZ-8);Blooming-2; Section Rolling Shop-2 (substation KRZ-5); Refractory & Lime preparation Shop; Steel Casting Shop(substation KRZ-17); and Converter Shop (substation KRZ-20).

Project description

In spite of the fact that the transformers can continue to operate for several years and do not constitute a bottleneck for the production capacity, they are old-fashioned and their efficiency is relatively low if compared with the current state of the art. This is confirmed by a measured average power factor lower than 0.8 in 2007, as shown in the table below:

Sub station	active electric power consumption per month [kWh]	reactive electric power consumption per month [kVarh]	Average current power factor	Expected future power factor
3	21888000	17215200	0.75	0.97
5	205848000	13716000	0.6-0.8	0.97

[2] Relationship between the current through a resistance and the heat dissipated, so called Joule's law.

8	5122800	6084000	0.8	0.97
17	9013680	8179200	0.739	0.97
20	16635240	12121200	0.839	0.97

Table 6: 2007 reactive power consumption and average power factors (cosφ) per sub-strations in 2007.

In order to reduce reactive power, it is proposed to install filter compensating devices at the five substations KRZ-3,5,8,17, and 20. The compensating devices would permit to raise the power factor, to reduce the current into the wires, and consequently to reduce power losses, resulting in indirect emission reduction from electricity generation in the Ukrainian electricity grid.

Time schedule

The sub-project is going to be completed before end of 2008. Due to the crisis and lack of financing, the execution of the project has been delayed for 1-2 years.

A.4.2.5 SP5 - New gas burner Installation

Project description

The sub-projects consist of:

a) Installation of new gas burners in some boilers of HPP 2 and HPP3;

b) Installation of new gas burners in the sinter shop #1 and #2;

Installation of new gas burners in one boiler of HPP-2 and 4boilers of HPP-3

The main objective of this sub-project is the revamping of steam boilers ПК-14-2М at HPP-2 and HPP3 with the change of fantail burners to flat flame burners. This would lead in NG saving, more efficient work of the boilers with the maximum possible utilization of BFG and COG and, decrease of the atmospheric discharges.

The replacement of fantail burners with more efficient flat flame burners will permit to increase the combustion calorimetric temperature of the prepared air-gas mixture and consequently to increase the BFG and COG intake and reduce NG consumption. The proposed intervention will be carried out to one boiler of HPP2 and four boilers of HPP3.

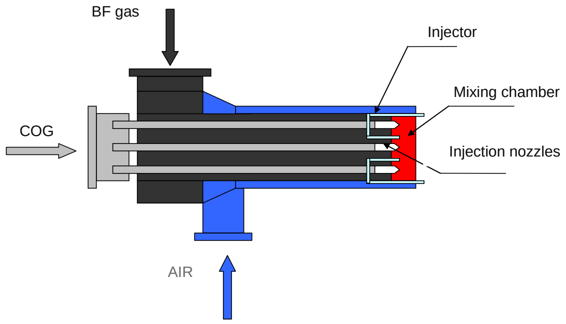


Figure 7: New gas burners installation at HPP-2 and HPP-3

Time schedule

The schedule of replacements can be summarized as follow:

2009	Boiler n.4 @ HPP2 completed in January Boilers 1 and 2 @ HPP3 completed in July

2010	Boilers n.3 and 4 @ HPP3 completed in July

Table 7: Boilers' replacement programme

Due to the crisis and lack of financing, the execution of the project has been delayed for 1-2 years.

Installation of new gas burners in the sinter shop #1 and #2

This sub-project foresees the sinter machines' furnaces reconstruction with the installation of ГНП.Р-250 burners in the Sinter Shops #1 and #2, with the objective of saving natural gas consumption for the ignition of the sintering mix.

The ГНП.Р-250 burners are equipped with special nozzles, where the fuel pre-heating takes place due to the injection and recirculation of preheated gas-air mixture from the nozzle tip, resulting in significant fuel savings, intensive sintering mix ignition, and sintering quality improvement. The expected natural gas consumption reduction is more than 21% of total. The burners replacement together with installation of automatic control systems would permit to increase the burning of BFG and COG otherwise flared to the atmosphere, and consequently to reduce natural gas consumption.

Time schedule

The Installation of new as burners in the sinter shop #1 and #2 will be completed before end of June 2008. Due to the crisis and lack of financing, the execution of the project has been delayed for 1-2 years.

A.4.2.6 SP6 - Turbo Generators Installation

Project description

The purpose of this sub-project is to

- recover the heat content of the waste gas otherwise flared into the atmosphere;
- utilise the recovered waste heat for steam generation; and
- utilise the steam generated for additional power generation.

This sub-project is a supply side energy efficiency improvement measure, enabling utilization of waste heat and improvement of efficiency of all system. Waste heat will be recovered from the process waste gas and will be used for steam generation.

The use of waste heat will permit to increase electricity production, therefore leading to indirect emission reductions.

The proposed intervention consists of:

a) the installation of a new 25 MW Turbo generator at HPP3

b) the installation of a new 25 MW Turbo generator at HPP1

Installation of a new 25 MW Turbo generator at HPP3

Context

HPP n.3 consists of 4 steam boilers using blast furnace gas and natural gas, and of two turbo-generators (60 MW electric power each). Each turbo generator has two steam exits: 8-18 atm @ 320°C and 1.2-2.5 atm @ 250°C.

Power generation is in two stages:

- **90 to 18 atm** (counter-pressure). 18 atm is then used for distribution to BF 9 (40 t/h) and plant degazer (50 t/h).
- **18 to 2.5** at vacuum (condensation). 2.2 atm is used for hot water production (110°C), and distribution.

Due to the lack of steam demand during summer, the turbo-generators run at about the half of their nominal power (around 30 MW each). In the baseline calculations, a conservative value of 60% of the nominal power has been considered.

Project description

The energy efficiency sub-project consists on the installation of a new 25 MW turbo-generator. This will permit to i) use the current TGs at full capacity also in the summer, and ii) feed the 18 atm steam to the new 25 MW TG. This new configuration would be in operation for about 6-7 months a year. In order to be conservative six months of operational time was considered in the calculations.

Blast Furnace Gas, otherwise flared into the atmosphere, will be used to produce the extra amount of steam required by the new summer configuration.

Time schedule

Implementation is going to be finished by end of 2010.

Installation of a new 25 MW Turbo generator at HPP1

At HPP1 a 25 atm condensing TG will be installed to better utilize the actually unexploited possibilities of HPP1 boilers. The boilers currently operate at partial load due to lack of steam demand, and the introduction of a new TG will permit to use the boilers at full capacity. Waste gas will be collect at the boilers to provide the additional amount of heat to produce the steam required to run the new TG. This action will increase electric production both during summer (additional electric power of 24 MW), and in winter (over 13 MWel).

Time schedule

Implementation is going to be finished by end of 2009.

A.4.2.7 SP7 - BF top recovery turbine installation

Context

The output of BFG from BF-9 for hot metal production is about 800-900,000 Nm^3/h with an expected top pressure of about 2.0-2.40 atm. In order to be used in other sections of the facility, the pressure of the BFG is reduced by using throttling valves.

Project description

This project activity foresees the installation of a top recovery turbine running with BFG coming from the BF-9. This installation will permit the BFG pressure to be reduced by avoiding the use of the throttling valve and, at the same time, to generate electric power by employing blast furnace top gas to drive the new turbine generator. The lower-pressured gas coming out of the turbine can then be used as fuel in other sections of the process.

BFG usually has pressure of 2-2.40 atm, and temperature of approximately 200°C at the furnace top. This technology is a method of generating power by employing this heat and pressure to drive a turbine-generator. The BFG collected from BF-9 will permit to reduce gas pressure and to have a power capacity of about 12MW.

Time schedule

Implementation is going to be finished by end of 2010.

A.4.2.8 SP8 - Heat recovery in Refractory and Lime Rotary Kilns

Context

The lime Production Plant consists of 5 rotary kilns for the production of lime from limestone. The kilns burn natural gas and are equipped with waste heat recovery boilers. These boilers produce steam from temperature of exhaust flue gases of rotary kilns for industrial and domestic needs with the following parameters: 16 atm pressure, and 360 °C temperature. Therefore, steam production does not require any fuel combustion.

Since the other shops in the plant require steam at 8 atm pressure and 270 °C temperature, some devices are used at the plant in order to reduce both steam temperature and pressure.

Project description

The proposed sub-project activity includes the installation of a condensing turbo generator in order to guarantee complete use of the enthalpy (temperature and pressure) of produced steam, and to generate electricity. Based on the steam parameters, a new turbo-generator of 6 MW nominal power is foreseen to be installed behind the recovery boilers.

Time schedule

Implementation is going to be finished by end of 2010.

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

The implementation of the energy efficiency projects described above can lead to a total estimated CO_2 emission reduction of 1.6 million tonnes until the end of 2012 by reducing electricity and NG consumptions. The EEIP is expected to reduce around 580 GWh of electricity and 35 Mln Nm^3 of NG per year.

Although the proposed energy efficiency measures are beneficial for the Company, there are barrier for the Project to be implemented without revenues coming from the sale of Carbon Credits.

Prevailing Practice Barriers

Steel industry sector of Ukraine was created during the Soviet era, when energy efficiency was not a priority for facilities. The majority of the players on the Ukrainian steel market continue to use those aged equipment without rehabilitation programmes, and, until now, the energy efficiency projects reported in steel sector in Ukraine are in the process of being registered as JI project. Therefore, in spite of ArcelorMittal dominant position in the market and its significant experience in restructuring large-scale operations, it is putting itself into a potential unfavourable position due to the risk of the new equipment failure. Additional revenue from the transfer of ERUs is a key factor to bring in foreign experience and technology to alleviate this barrier.

Financial barrier

The market of project financing in Ukraine is limited to short-term financing, and the interest rates of the local banks are high. The total cost of the proposed Project is around 100 million USD and it is hard obtaining such amount on the national market. On the other hand, on the international market obtaining financing would also be difficult due to the low credit rating of Ukraine and the high perceived risks of the country's market. In spite of the fact that ArcelorMittal as global Company has access to the required financial resources to finance the project, revenues from the sales of ERUs are considered critical to limit the financial risks to be sustained for the implementation of the Project.

Taking into account these issues, in absence of the proposed Project, all equipment (including the old-fashioned but still workable for a long-time period units) will operate in a business-as-usual mode, and no emission reduction would occur.

Based on the identified barriers and the impact of Joint Implementation, the proposed JI Project is additional to what would otherwise occur.

A more detailed description on baseline setting and additionality for each sub-project, can be found in the section B and in Annex 2 of the present PDD.

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

	Years
Length of the crediting period	5
Year	Estimate of annual emission reduction in tonnes of CO_2 equivalent
Year 2008	26,406.6
Year 2009	142,757.7
Year 2010	266,746.7
Year 2011	580,911.2
Year 2012	586,878.5
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	1,603,701
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	320,740

Table 8: Estimated amount of emission reductions over the crediting period

A.5. Project approval by the Parties involved:

The Ministry of Environment of Ukraine has signed the Letter of Endorsement on May the 12th 2008. Scan copy of the letter is reported as Annex 4 to the present PDD.

After the completion of the determination process, the PDD together with the Determination Report will be presented to the legal bodies of Ukraine and Luxembourg to obtain the Letters of Approval.

SECTION B. Baseline

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

Any baseline for a JI Project should be established in accordance with Appendix B of the Marrakesh Accords[3] and in accordance with guidance of the Joint Implementation Supervisory Committee (JISC).

Based on "Guidelines on criteria for baseline setting and monitoring – version 01"[4], approved CDM methodologies can be used to develop PDDs of JI projects. Since none of the existing approved methodologies can be fully applied to the Project as a whole, a different approach to define the baseline and demonstrate additionality has been used for each of the proposed sub-projects.

When possible, reference to approved methodologies has been made. When approved methodologies were not applicable, the Guidelines for completing the proposed new baseline and monitoring methodologies have been followed.

Formulae included in this section "B" refer to calculation used to estimate the preliminary ex ante emission reductions to be included in the present PDD. Formulae, included in the section "D" of the PDD use an ex-post approach that will be used in the monitoring plan.

B.1.1 SP1 - Modernization of Air Separating Unit:

B.1.1.1 Source

In spite of the fact that there are not approved methodologies fully applicable to set baseline and demonstrate additionality of the present sub-project, the baseline setting described hereinafter make reference to the simplified baseline and monitoring methodology AMS-II.C "Demand side energy efficiency activities for specific technologies – version 09".

This baseline setting also refers to the latest approved versions of the following tools:

- Guidelines for completing the proposed new baseline and monitoring methodologies – version 06.2;
- Combined tool to identify the baseline scenario and demonstrate additionality – version 02.1;
- Tool for the demonstration and assessment of additionality – version 04;
- "Standardized emission factor for the Ukrainian electricity grid", version 5 dated 2 February 2007. This document is reported in annex 2 for consultation.

B.1.1.2 Selected approach

The selected approach from paragraph 48 of the CDM modalities and procedures is "existing actual or historical emissions, as applicable".

[3] FCCC/CP2001/13/Add.2 16/CP.7

[4] ji.unfccc.it

B.1.1.3 Applicability conditions

This baseline setting for this sub-project can refer to the methodology mentioned above since the sub-project envisages the installation of new Air Separating Unit. The aggregate energy savings associated to the implementation of this sub-project do not exceed the equivalent of 60 GWh per year.

B.1.1.4 Sub-project boundaries

The geographical extent project boundaries include:

1) The section of the plant where the Air Separating Units are located,
2) The section of the plant where the sub-project #2 (eight compressor units) is located and
3) The National electricity grid where indirect emission reduction will take place.

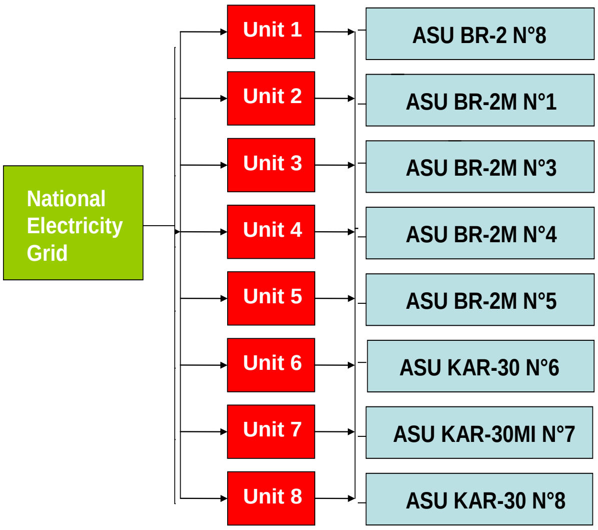


Figure 8: Sub-Project #1 boundaries

Overview of emission sources included in or excluded from the project boundary is provided in the following table:

	Source	Gas	Included?	Justification/explanation
Baseline	Electricity generation from the grid	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification: conservative assumption
		N_2O	Excluded	Excluded for simplification: conservative assumption
Project Activity	Electricity generation from the grid	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification

B.1.1.5 Identification of the baseline scenario and demonstration of additionality

The next two steps foresee the identification of the baseline scenario and the demonstration of additionality.

The AMS-II.C the "tool for demonstration and assessment of additionality" and the "Combined tool to identify the baseline scenario and demonstrate additionality" have been used to identify the main principles underlying the baseline setting, additionality, and monitoring. While identifying the baseline and project emissions, the general principles of Annex B of 16/CP.7, (in particular: (i) project-specific approach, (ii) taking conservative assumption, and (iii) taking into account relevant policies) have been adhered too.

Applicability

The "Combined tool to identify the baseline scenario and demonstrate additionality – Version 2.1" provides for a step-wise approach to identify the baseline scenario and simultaneously demonstrate additionality.

This Project envisages that:

- Energy improvements at existing installations are operated by project participants;

Since all the potential alternative scenarios identified in the following paragraphs, are under control of the project participants, and the methodology also applies to the construction of new facilities, the present methodology is fully applicable to the proposed Sub-Project.

Approach to select the baseline scenario and assess additionality

The baseline is the scenario that reasonably represents the anthropogenic emission by source of greenhouse gas that would otherwise occur in absence of the proposed Project[5].

The tool provides a general framework for identifying the baseline scenario and demonstrating additionality. The procedure foresees the application of the following sub-steps:

- STEP 1: Identification of alternative scenarios;
- STEP 2: Barrier analysis;
- STEP 3: Investment analysis (if applicable);
- STEP 4: Common practice analysis

The procedure is summarized in the indicative flowchart below:

[5] FCCC/CP/2001/13/Add.2 16/CP.7.Appendix B

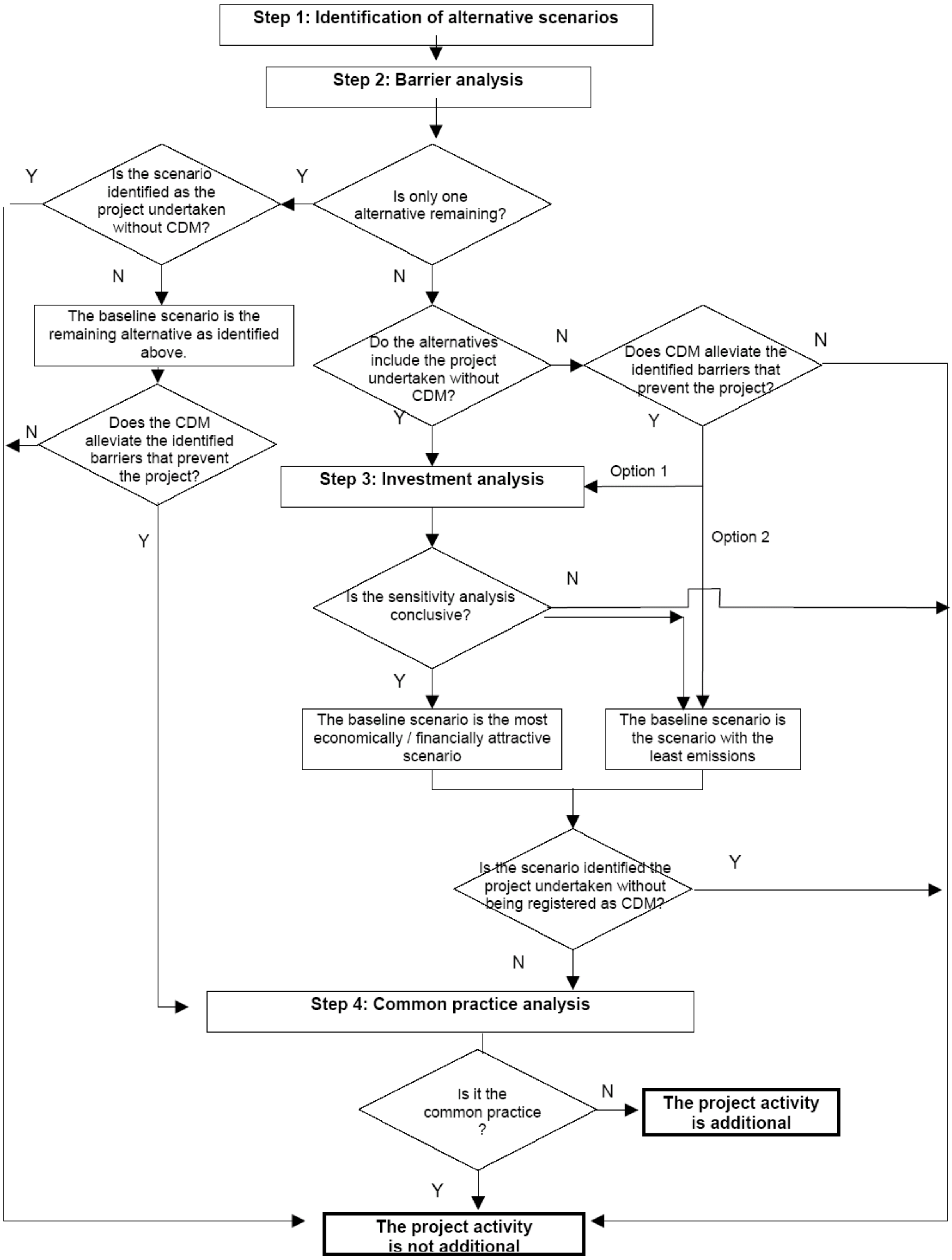


Figure 9: Flowchart of the "Combined tool to identify the baseline scenario and demonstrate additionality – Version 2.1"procedure

STEP 1. Identification of alternative scenarios

Step 1a. Define alternative scenarios to the proposed JI project activity.

The baseline alternatives to be considered can be summarized as follow:

a) Continuation of the existing situation

This scenario foresees the continuation of activities under a business-as-usual scenario. In absence of the project activity, AMKR could continue with the existent practice of oxygen generation.

b) Implementation of the proposed Project activity without being registered as a JI

This scenario foresees the establishment of the new ASU AKAR-40/35 even in absence of the JI incentives.

c) Use of alternative technologies rather than those proposed by the Project participant

This scenario foresees the production of the same amount of oxygen foreseen in this sub-project, with alternative technologies compared with those proposed by the project participants.

Step 1b. Consistency with mandatory applicable laws and regulations

All the alternatives defined in the Step 1 above are in compliance with all mandatory applicable legal and regulatory requirements.

The following step foresees the project developer to choose between the Barrier and the investment analysis. Even if it is not necessary, both the two paths have been developed in order to better provide evidence of the baseline and additionality of this project.

STEP 2. Barrier analysis

This step serves to identify barriers and to assess which alternatives these barriers prevent.

Sub-step 2a. Identify barriers that would prevent the implementation of alternatives scenarios:

The barriers that may prevent alternative scenarios to occur can be summarized as follow:

- Barriers to access to financial resources: The market of project financing in Ukraine is limited to short-term financing, and the interest rates of the local banks are high. The total cost of the proposed Project is around 100 million USD and it is hard obtaining such amount on the national market. On the other hand, on the international market obtaining financing would also be difficult due to the low credit rating of Ukraine and the high perceived risks of the country's market.
- Technological barriers:
  - Skilled and/or properly trained labor to operate and maintain the technologies is not available in the relevant geographic area.
  - Risk for technological failure: the technology failure risk in the local circumstances is significantly greater than that proposed for the project.
- Prevailing practice barrier: absence of energy saving activities in the steel sector of Ukraine over the last 10-15 years.

Sub-step 2b. Eliminate alternative scenarios which are prevented by the identified barriers

The alternative c) "Use of alternative technologies rather than those proposed by the project participant" faces a specific technological barrier. ArcelorMittal has significant experience in restructuring large-scale operations. The Company will be able to draw on the collective experience and expertise of ArcelorMittal.

Nonetheless, the use of different technologies rather than those proposed by the project participants could lead to an unacceptable risk of equipment disrepair, malfunctioning or other underperformances due to the lack of skills and experience in the relevant geographic area. Moreover, there is no logical solution for installing different type of Air Separating Unit than that proposed by AMKR. The installation of ASU AKAR-40/35 is the logical solution to increase the oxygen production of the plant and to improve back-up capacity.

Thus, there are not acceptable reasons for implementing different technologies than those proposed by the Company. Moreover, the measures proposed for the project shall lead to consistent improvement in the energy efficiency of the operations.

Therefore, this alternative has been excluded from further considerations.

The two remaining scenarios that can be viewed as alternative scenarios are: the continuation of the existing situation or the proposed intervention without the JI incentive.

The alternative a) "continuation of existing situation" does not require any investment by the Company and therefore is not affected by the barriers listed above.

Moreover, there are not sectoral, legislative, economical, and environmental key factors that oblige to carry out any change in the business-as-usual-operations, as:

- There is no need to modernize the current ASUs to meet the oxygen demand a the plant;
- steel industry sector of Ukraine was created during the Soviet era, when energy efficiency was not a priority for facilities. ArcelorMittal's competitors playing on the Ukrainian steel market continue to use the aged equipment without rehabilitation programmes;
- the facility complies with the current regulations and no relevant development in legislation within the Host Country is foreseen in the next years;
- the Company is one of the lowest cost steel producers in the world. It has established markets in emerging regions which have a particularly high growth in steel demand;
- no environmental issues are associated with the continuation of the current operations.

The alternative b) "Implementation of all the proposed intervention without the JI incentive" faces both prevailing practice and financial barriers.

Prevailing practice barrier

The proposed JI activity faces barrier due to the prevailing practice. No significant energy saving activities have been observed in the Ukrainian steel sector over the past 10-15 years. This is best demonstrated by comparing the average fuel consumption of steel production in Ukraine with the average of European Union. As shown in the table below, the specific energy consumption in Ukraine is four-five times higher than the average in the European Union.

Country	Electricity	Natural Gas	Coal and Coke	Total
Ukraine	0.405 – 0.435	0.200 - 0.237	0.018 – 0.059	0.311 – 0.730
EU	0.038 – 0.120	0.020 – 0.055	0.0005 – 0.013	0.058 – 0.188

Table 9: Specific energy consumption per tonne of steel produced (TJ/t)[6]

The majority of the other players on the Ukrainian steel market continue to use the aged equipment without rehabilitation programmes. Therefore, in spite of its dominant position in the market and its significant experience in restructuring large-scale operations, ArcelorMittal is putting itself into a potential unfavourable position due to the risk of the new equipment failure.

Prevailing practice constitutes a barrier for the proposed activity, without mitigation derived from the revenues associated to the selling of carbon credits.

Barriers to access to financial resources (financial barriers)

The total investment cost for the proposed Project is around USD 100 Million. Ukraine has a weak credit sector with the availability of financing to the industrial sector of only 12% of the GDP compared to 43% in Estonia or 45% in Hungary[7]. The market of project financing in Ukraine is limited to short-term financing and the interest rates of the local banks are high. A common practice for the commercial bank financing can be a loan for up to maximum 3 years at 18-24% interest rate in the national currency.

Although it is difficult to get hard evidence of the required maximum maturity of the domestic financial sector, it is generally accepted that project finance in Ukraine is virtually absent and it would be hard obtaining such amount on the national market.

On the other hand, due to the perceived high country risk of Ukraine, obtaining a long-term financing on the international capital at reasonable terms would also be unlikely, also given the fact that the project is not the common practice in Ukraine. An example of Fitch sovereign credit rating for Ukraine compared to some other countries of Eastern Europe is summarized here below:

- Ukraine BB-
- Poland BBB+
- Hungary A-
- Slovak Republic A-

This is further confirmed by the following article about project financing: "*The Ukraine continues to pose some investment risks due to political, economic and legislative instability. To date, these risks have made strictly private long term financing prohibitively expensive or impossible to obtain, leaving quasi-public multilateral financial institutions as the principal sources for Ukrainian project financing*."[8].

In spite of the fact that ArcelorMittal, as global Company, has access to the required financial resources to finance the Project, at least two main financial barriers face its implementation. First the high financial indicators' values required by the Corporate prior to finance internal projects, and second the financial

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6 "Analysis and implementation of increasing the ecological impact of Marten steel production", http://masters.donntu.edu.ua/2005/fizmet/nikolnikova/diss/index.htm#un

7 EBRD and Economist Intelligence Unit, issue 16 November 2005

8 Alexey V. Didkoviskiy, "Project Financing", the Ukrainian Journal of Business Law, May 2003

risks associated to the implementation of projects in Ukraine (as described above). For these reasons, revenues from the sales of ERUs are considered by the Company critical to limit the financial risks to be sustained for the implementation of the Project.

To support this thesis, it has to be mentioned the Company signed a loan with an international Bank: the European Bank for Reconstruction and Development ("EBRD"), to cover part of the investment costs. The EBRD is one of the very few international institutions involved in financing energy investments in Eastern-Europe Countries and one of the conditions to provide funds is the use of part of the loan to implement energy efficiency and climate change projects to be then registered under the Kyoto Protocol mechanisms.

For all these reasons "Access to financial resources" constitutes a barrier for the proposed activity.

Based on all the considerations reported, the only alternative scenario to the project activity not prevented by any barrier is:

a) Continuation of the existing situation

The "Combined tool to identify the baseline scenario and demonstrate additionality" reports that: "*if there is only one alternative scenario that it is not prevented by any barrier, and this alternative is **not** the proposed project undertaken without being registered as a JI project activity, then this alternative scenario is identified as baseline scenario and the "step 3" can be avoided*".

Based on this assumption "Continuation of existing situation" represents the baseline scenario for the proposed JI project.

STEP 3. Investment analysis

Even if "Continuation of existing situation" is the only alternative remaining scenario, and therefore can be considered as the baseline for this sub-project, in order to provide with more evidence about the additionality of the project, here below an investment analysis is provided. This specific sub-section takes reference to the "tool for the demonstration and assessment of additionality – version 04".

Sub-step 3a.Determination of appropriate analysis method

Three different financial analysis options can be used to carry out the investment analysis: i) simple costs analysis; ii) investment comparison analysis; iii) benchmark analysis.

Since the proposed sub-project produces economic benefits (other than JI related incomes) by saving electricity purchased from the grid, the "simple costs analysis" can not be used in this case. Moreover, obtaining financial indicators for similar projects in Ukraine is not possible, therefore also the investment comparison analysis can not be performed. For the reasons mentioned above, the chosen option to apply for this financial analysis is the "benchmark analysis".

The analysis is based on the calculation of the most common financial indicators of the proposed project as IRR, and NPV and the consequent comparison with ArcelorMittal global targets.

Sub-step 3b.Calculation and comparison of financial indicators

The main drivers of the financial analysis for the proposed sub-project activity are all relevant costs for implementation of the project, and the revenues (excluding Carbon Credit revenues) coming from the energy savings associated with the project implementation.

Since ArcelorMittal is the only project developer, the calculated financial parameters have been compared with the corporate internal benchmark (Weighted average capital cost of the company, WACC). In performing such analysis it has to be taken into account that ArcelorMittal has never implemented energy efficiency investments in Ukraine prior to this project activity.

The WACC usually taken as reference by the company is 15%. However, the "tool for the demonstration and assessment of additionality" reports that the project risk have to be included through the cash flow pattern. In order to cover the risk factor associated to invest in such kind on countries the Corporate WACC was reasonably set around 20%, lower than the average discount rates provided by banks providing funds for energy investments in Ukraine usually higher than 21-23%[9].

The economic indicators for the proposed sub-project without JI revenues have been calculated utilizing financial criteria developed during the PDD preparation, and by running a preliminary CAPEX program that is provided as annex to the present document.

In implementing the model, the following assumptions have been considered:

- Electricity and natural gas prices are the most updated values available (end of 2007);
- The installation of the new ASU will permit to increase back-up capacity and to reduce possibility of stop of production because of system failures;
- O&M costs are considered to be zero (conservative assumption);
- Price of carbon credits has been fixed at 24.5€/ERU[10].

The main economic inputs for the present sub-project can be summarized as follow:

INPUT DATA		
Investment	31,556	kEur
Additional O&M costs	0	kEur
Annual saving	6,740	kEur
Life time	15	Yrs
Corporation Tax	25%	%
Discount Rate / WACC	20.0%	%

Table 10: Financial inputs for Sub-Project 1

The main results of the financial analysis can be summarized as follow:

RESULTS	Without JI		With JI	
IRR	15.6%	%	16.3%	%
NPV	-5,582	kEur	-4,668	kEur
Payback time	5.7	Yrs	5.5	Yrs

Table 11: Financial indicators for Sub-Project 1

The financial results show that the project is slightly below the benchmark proposed for this project due to the Country risks. Carbon credit can help to cover part of these risks.

[9] PriceWaterhouseCoopers, *Taxes at a glance, 2008*

[10] Source: SG Commodities Research – ww.carbonium.fr/research0701.pdf

Sub-step 3c. Sensitivity Analysis

A sensitivity analysis of the proposed sub-project was made in order to check the robustness of the financial results. Parameters that more likely could change in the future are the price of electricity, the expected electricity savings, the total investment costs and the price of carbon credits.

Sensitivity Analysis	IRR Without JI		IRR With JI	
Electricity savings up by 10%	16.4	%	17.7	%
Electricity Price up by 10%	15.8	%	16.5	%
Investment 10% down	17.7	%	18.5	%
Carbon Credit price 10% down	15.6	%	16.2	%

Table 12: Sensitivity Analysis for Sub-Project 1

The results show that the sub-project scenario is not significantly affected by any of the parameters object of the present sensitivity analysis.

Since the project-activity has a less favourable indicator (lower IRR) than the benchmark, this sensitivity analysis together with the financial analysis explained above, confirms the results of the barrier analysis that "Continuation of existing situation" represents the baseline scenario for the proposed sub-project.

Impact of JI registration

In spite of the fact that carbon credits can't permit to reach the expected IRR set for this project (around 20%), it is undoubted they will permit to cover part of the risks associated with the implementation of this sub-project in Ukraine. Moreover, the revenues from carbon credit selling would permit to cover about the 10% of the total costs, and to help eliminating the financial barrier previously described.

Based on these consideration carbon credits are considered critical by the project proponent.

STEP 4. Common practice analysis

This JI project is not a common practice. In spite of the fact that several metallurgical companies are considering reducing the energy consumptions, in particular after the price hike during 2006, the majority of the other players on the Ukrainian steel market continue to use aged equipment without rehabilitation programmes. At the time of writing, no investment projects are known that have been implemented.

The project developer is aware of energy efficiency projects currently under consideration or under construction in the Ukrainian steel sector, but they are in the process to be registered as JI projects, being:

- Introduction of energy efficiency measures at ISTIL mini steel mill;
- Revamping and modernization of Alchevsk Steel Mill, using higher efficiency technologies;
- Displacement of electricity generation with fossil fuels in the electricity grid by an electricity generation project with introduction of steel mill waste gas firing turbine power generation system.

In accordance with the methodological tool, since no CDM or JI project activities are to be considered in this analysis, similar activities to the proposed JI project cannot be observed.

To conclude, based on the "Combined tool to identify the baseline scenario and demonstrate additionality" the proposed Sub-Project is not to be considered common practice and it is additional to what would otherwise occur.

B.1.1.6 Baseline Emissions

The energy baseline is the electricity that would have been used by the current Air Separating Units in the baseline scenario to cover the oxygen production of the new unit, without implementation if the project, and can be calculated as follow:

$$EC_{SP1,BS,y} = SC_{OP,BS,y} \cdot OP_{BS,y} \cdot EC_{CA,BS,y} \quad \text{(a.1)}$$

Where:

$EC_{SP1,BS,Y}$ = annual energy baseline in MWh/y;

$SC_{OP,BS,y}$= Specific consumption of Compressed Air for Oxygen Production in the baseline scenario in m^3Air/m^3 Oxygen;

$EC_{CA,BS,y}$= electricity consumption for compressed air production for ASUs in the baseline scenario in the year y in MWh/ m^3Air;

$OP_{BS,y}$= Oxygen production in the ASU included in the baseline scenario in the year y in m^3 Oxygen/y

The Baseline emissions for the year y are determined by multiplying the energy baseline with the emission coefficient of the Ukrainian electricity grid expressed in t CO_2/MWh. This coefficient for the Ukrainian Electricity Grid refers to the document "Standardized emission factor for the Ukrainian electricity grid", version 5 dated 2 February 2007. The complete document is included in Annex 2 for consultation.

Details of baseline emissions calculations are included in section D and annex 2 of the present PDD.

B.1.1.7 Project Emissions

The energy project consumption is the electricity that will been used by the new ASU AKAR 40/35 included in the project boundaries of the Sub-Project, and can be calculated as follow:

$$EC_{SP1,PS,y} = SC_{OP,PS,y} \cdot OP_{PS,y} \cdot EC_{CA,PS,y} \quad \text{(a.2)}$$

Where:

$EC_{SP1,PS,y}$ = Energy project consumption in MWh/y

$SC_{OP,PS,y}$= Specific consumption of Compressed Air for Oxygen Production in the Project scenario in m^3Air/m^3 Oxygen;

$OP_{PS,y}$= Oxygen production in the ASU included in the project boundaries of the Sub-Project in the year y in m^3 Oxygen/y;

$EC_{CA,PS,y}$= electricity consumption for compressed air production for ASU included in the project boundaries of the Sub-Project in the year y in MWh/m^3Air;

The Project emissions for the year y are determined by multiplying the energy baseline with the emission coefficient of the Ukrainian electricity grid expressed in t CO_2/MWh. This coefficient for the Ukrainian Electricity Grid was calculated as described in the document "Standardized emission factor for the Ukrainian electricity grid", version 5 dated 2 February 2007.

Details of project emissions calculations are included in section D and annex 2 of the present PDD.

B.1.1.8 Leakage

No transfer of equipment is foreseen. Therefore, leakages are not to be considered.

B.1.1.9 Emission Reductions

Emission reductions due to this sub-project activity during the year y are calculated as the difference between the baseline and the project emissions. The formulae can be reported as follow:

$$ER_{SP1,y} = BE_{SP1,y} - PE_{SP1,y} \quad (a.3)$$

Where:

$ER_{SP1,Y}$ = Emission reduction in year y for implementation of Sub-Project #1 [tCO_2];

$BE_{SP1,Y}$ = Baseline emissions in year y [tCO_2];

$PE_{SP1,Y}$ = Project emissions in year y for implementation of Sub-Project #1 [tCO_2];

B.1.2 SP2 - Modernization of Compressors station

B.1.2.1 Source

In spite of the fact that there are not approved methodologies fully applicable to set baseline and demonstrate additionality of the present sub-project, the baseline setting described hereinafter make reference to the simplified baseline and monitoring methodology AMS-II.C "Demand side energy efficiency activities for specific technologies – version 09".

This baseline setting also refers to the latest approved versions of the following tools:

- Guidelines for completing the proposed new baseline and monitoring methodologies – version 06.2;
- Combined tool to identify the baseline scenario and demonstrate additionality – version 02.1;
- Tool for the demonstration and assessment of additionality – version 04;
- "Standardized emission factor for the Ukrainian electricity grid", version 5 dated 2 February 2007. This document is reported in annex 2 for consultation.

B.1.2.2 Selected approach

The selected approach from paragraph 48 of the CDM modalities and procedures is "existing actual or historical emissions, as applicable".

B.1.2.3 Applicability conditions

This baseline setting for this sub-project can refer to the methodology mentioned above since the sub-project envisages the modernization compressors at the plant, to increase energy efficiency of compressed air production. Moreover, the aggregate energy savings associated to the implementation of this sub-project do not exceed the equivalent of 60 GWh per year.

B.1.2.4 Sub-project boundaries

The geographical extent project boundaries include:

1) the section of the plant where the compressors are installed,
2) The ASUs operations that are strictly connected to the compressed air production, and
3) the National electricity grid where indirect emission reduction will take place.

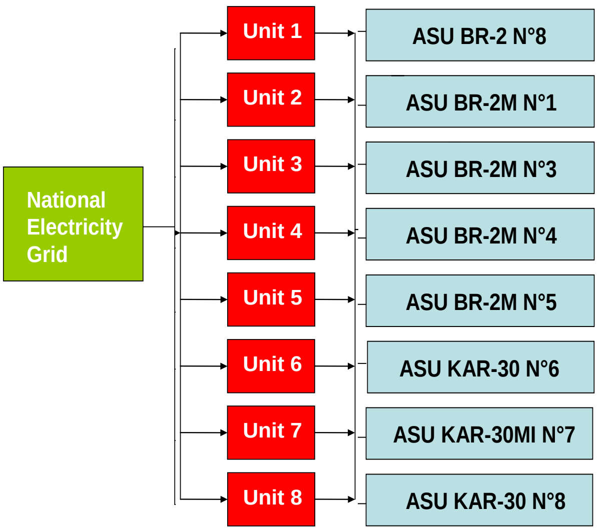


Figure 10: Sub-Project #2 boundaries

Overview of emission sources included in or excluded from the project boundary is provided in the following table:

	Source	Gas	Included?	Justification/ explanation
Baseline	Electricity generation from the grid	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification: conservative assumption
		N_2O	Excluded	Excluded for simplification: conservative assumption
Project Activity	Electricity generation from the grid	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification

B.1.2.5 Identification of the baseline scenario and demonstration of additionality

The next two steps foresee the identification of the baseline scenario and the demonstration of additionality.

The AMS-II.C the “tool for demonstration and assessment of additionality” and the “Combined tool to identify the baseline scenario and demonstrate additionality”[11] have been used to identify the main principles underlying the baseline setting, additionality, and monitoring. While identifying the baseline and project emissions, the general principles of Annex B of 16/CP.7 (in particular: (i) project-specific approach, (ii) taking conservative assumption, and (iii) taking into account relevant policies) have been adhered too.

Applicability

The “Combined tool to identify the baseline scenario and demonstrate additionality – Version 2.1” provides for a step-wise approach to identify the baseline scenario and simultaneously demonstrate additionality.

This Project envisages that:

- Energy improvements at existing installations are operated by project participants;

Since all the potential alternative scenarios identified in the following paragraphs, are under control of the project participants the present methodology is fully applicable to the proposed Sub-Project.

Approach to select the baseline scenario and assess additionality

Please refer to paragraph §B.1.1.5.

STEP 1. Identification of alternative scenarios

Step 1a. Define alternative scenarios to the proposed JI project activity.

The baseline alternatives to be considered can be summarized as follow:

a) Continuation of the existing situation

This scenario foresees the continuation of activities under a business-as-usual scenario. In absence of the project activity, AMKR could continue with the existent practice of compressed air generation. The compressors currently on operation at the plant (series K-1500) are old-fashioned but still workable.

b) Implementation of the proposed Project activity without being registered as a JI

This scenario foresees the modernization of the compressors even in absence of the JI incentives.

c) Use of alternative technologies rather than those proposed by the Project participant

This scenario foresees the production of the same amount of compressed air foreseen in this sub-project, with alternative technologies compared with those proposed by the project participants.

Step 1b. Consistency with mandatory applicable laws and regulations

All the alternatives defined in the Step 1 above are in compliance with all mandatory applicable legal and regulatory requirements.

[11] Draft Working Programme Methodologies Panel – 24th Meeting, Annex 17

The following step foresees the project developer to choose between the Barrier and the investment analysis. Even if it is not necessary, both the two paths have been developed in order to better provide evidence of the baseline and additionality of this project.

STEP 2. Barrier analysis

Sub-step 2a. Identify barriers that would prevent the implementation of alternatives scenarios:

Barriers that would prevent the implementation of alternative scenarios are the same as described at paragraph §B.1.1.5, Sub-step 2a and, for this reason, they are not repeated here.

Sub-step 2b. Eliminate alternative scenarios which are prevented by the identified barriers

The alternative c) "Use of alternative technologies rather than those proposed by the project participant" faces a specific technological barrier. ArcelorMittal has significant experience in restructuring large-scale operations. The Company will be able to draw on the collective experience and expertise of ArcelorMittal.

Nonetheless, the use of different technologies rather than those proposed by the project participants could lead to an unacceptable risk of equipment disrepair, malfunctioning or other underperformances due to the lack of skills and experience in the relevant geographic area. Moreover, there is no reason for installing different type of compressed air production systems than those proposed by AMKR. The refurbishment of old K-1500 units with new K-1700 is the logical solution to meet the compressed air demand of the plant.

Thus, there are not acceptable reasons for implementing different technologies than those proposed by the Company. Moreover, the measures proposed for the project shall lead to consistent improvement in the energy efficiency of the operations.

Therefore, this alternative has been excluded from further considerations.

The two remaining scenarios that can be viewed as alternative scenarios are: the continuation of the existing situation or the proposed intervention without the JI incentive.

The alternative a) "continuation of existing situation" does not require any investment by the Company and therefore is not affected by the barriers listed above.

Moreover, there are not technical, sectoral, legislative, economical, and environmental key factors that oblige to carry out any change in the business-as-usual-operations, as:

- There is no need to refurbish the old compressors to meet the compressed air demand a the plant;
- all equipments that will be replaced by implementing the sub-project activities are still workable for a long time period, including the old ones;
- steel industry sector of Ukraine was created during the Soviet era, when energy efficiency was not a priority for facilities. ArcelorMittal's competitors playing on the Ukrainian steel market continue to use the aged equipment without rehabilitation programmes;
- the facility complies with the current regulations and no relevant development in legislation within the Host Country is foreseen in the next years;
- the Company is one of the lowest cost steel producers in the world. It has established markets in emerging regions which have a particularly high growth in steel demand;

- no environmental issues are associated with the continuation of the current operations.

The alternative b) “Implementation of all the proposed intervention without the JI incentive” faces both prevailing practice and financial barriers.

Reasons why “Implementation of the proposed intervention without the JI incentive” faces prevailing practice and financial barriers are the same as described at §B.1.1.5, and are not repeated here.

Based on all the considerations reported at §B.1.1.5, the only alternative scenario to the project activity not prevented by any barrier is:

a) Continuation of the existing situation

The “Combined tool to identify the baseline scenario and demonstrate additionality” reports that: “*if there is only one alternative scenario that it is not prevented by any barrier, and this alternative is **not** the proposed project undertaken without being registered as a JI project activity, then this alternative scenario is identified as baseline scenario and the “step 3” can be avoided*”.

Based on this assumption “Continuation of existing situation” represents the baseline scenario for the proposed JI project.

STEP 3. Investment analysis

Even if “Continuation of existing situation” is the only alternative remaining scenario, and therefore can be considered as the baseline for this sub-project, in order to provide with more evidence about the additionality of the project, here below an investment analysis is provided. This specific sub-section takes reference to the “tool for the demonstration and assessment of additionality”.

Sub-step 3a.Determination of appropriate analysis method

For the determination of the appropriate analysis method please refer to §B.1.1.5., sub-step3a.

Sub-step 3b.Calculation and comparison of financial indicators

The main drivers of the financial analysis for the proposed sub-project activity are all relevant costs for implementation of the project, and the revenues (excluding Carbon Credit revenues) coming from the energy savings associated with the project implementation.

Since ArcelorMittal is the only project developer, the calculated financial parameters have been compared with the corporate internal benchmark (Weighted average capital cost of the company, WACC). In performing such analysis it has to be taken into account that ArcelorMittal has never implemented energy efficiency investments in Ukraine prior to this project activity.

The WACC usually taken as reference by the company is 15%. However, the “tool for the demonstration and assessment of additionality” reports that the project risk have to be included through the cash flow pattern. In order to cover the risk factor associated to invest in such kind on countries the Corporate WACC was reasonably set around 20%, lower than the average discount rates provided by banks providing funds for energy investments in Ukraine usually higher than 21-23%.

The economic indicators for the proposed sub-project without JI revenues have been calculated utilizing financial criteria developed during the PDD preparation, and by running a preliminary CAPEX program that is provided as annex to the present document.

In implementing the model, the following assumptions have been considered:

- Electricity and natural gas prices are the most updated values available (end of 2007);
- O&M costs are considered equal to zero (conservative assumption);
- Price of carbon credits has been fixed at 24.5€/ERU.

The main economic inputs for the present sub-project can be summarized as follow:

INPUT DATA		
Investment	6,222	kEur
Additional O&M costs	0	kEur
Annual saving	1,742	kEur
Life time	15	Yrs
Corporation Tax	25	%
Discount Rate / WACC	20.	%

Table 13: Financial inputs for Sub-Project 2

The main results of the financial analysis can be summarized as follow:

RESULTS	Without JI		With JI	
IRR	14.8	%	19.0	%
NPV	-1,590	kEur	-284	kEur
Payback time	5.91	Yrs	4.9	Yrs

Table 14: Financial indicators for Sub-Project 2

The financial results show that the expected project profit is not sufficient to cover the corporate benchmark required for this project. Carbon credit revenues would permit to cover almost all additional risk factor associated with project implementation in Ukraine.

Sub-step 3c. Sensitivity Analysis

A sensitivity analysis of the proposed sub-project was made in order to check the robustness of the financial results. Parameters that more likely could change in the future are the price of electricity, the expected electricity savings, the total investment costs and the price of carbon credits.

Sensitivity Analysis	IRR Without JI		IRR With JI	
Electricity savings up by10%	16.2	%	20.4	%
Electricity Price up by 10%	16.2	%	20.4	%
Investment 10% down	16.4	%	21.1	%

Carbon Credit price 10% down	14.8	%	18.6	%

Table 15: Sensitivity Analysis for Sub-Project 2

The results show that the sub-project scenario is not significantly affected by any of the parameters object of the present sensitivity analysis.

Since the project-activity has a less favourable indicator (lower IRR) than the benchmark, this sensitivity analysis together with the financial analysis explained above, confirms the results of the barrier analysis that "Continuation of existing situation" represents the baseline scenario for the proposed sub-project.

Impact of JI registration

Revenues coming from selling of carbon credits could permit to reach the Company benchmark and to cover almost all the risks associated with the implementation of the project in Ukraine.

STEP 4. Common practice analysis

Considerations on how this sub-project have not to be considered common practice are the same as those included at §B.1.1.5-STEP 4, and are not repeated here.

To conclude, based on the "Combined tool to identify the baseline scenario and demonstrate additionality" the proposed Sub-Project is not to be considered common practice and it is additional to what would otherwise occur.

B.1.2.6 Baseline Emissions

The energy baseline is the electricity that would have been used by the k-1500 compressors in the baseline scenario and can be calculated as follow:

$$EC_{SP2,BS,y} = \sum_i (n_i \cdot p_i \cdot o_i) \qquad \text{(a.4)}$$

Where:

$EC_{SP2,BS,Y}$ = annual energy baseline in kWh/y;

n_i= number of compressors for which the refurbishment is operating during the year "y";

p_i= the power of the compressors to be refurbished in kW;

o_i= the average annual operating hours of the devices to be refurbished in h/y.

The Baseline emissions for the year y are determined by multiplying the energy baseline with the emission coefficient of the Ukrainian electricity grid expressed in t CO_2/MWh. This coefficient for the Ukrainian Electricity Grid refers to the document "Standardized emission factor for the Ukrainian electricity grid", version 5 dated 2 February 2007. The complete document is included in Annex 2 for consultation.

Details of baseline emissions calculations are included in section D and annex 2 of the present PDD.

B.1.2.7 Project Emissions

The energy project consumption is the electricity that will been used by the refurbished compressors in the project scenario and can be calculated as follow:

$$EC_{SP2,PS,y} = \sum_i (n_i \cdot p_i \cdot o_i) \qquad \text{(a.5)}$$

Where:

$EC_{SP2,PS,Y}$ = annual energy project consumption in kWh/y;

n_i= number of compressors for which the refurbishment is operating during the year "y";

p_i= the power of the compressors refurbished in kW;

o_i= the average annual operating hours of the devices refurbished in h/y.

The Project emissions for the year y are determined by multiplying the energy baseline with the emission coefficient of the Ukrainian electricity grid expressed in t CO_2/MWh. This coefficient for the Ukrainian Electricity Grid was calculated as described in the document "Standardized emission factor for the Ukrainian electricity grid", version 5 dated 2 February 2007.

Details of project emissions calculations are included in section D and annex 2 of the present PDD.

B.1.2.8 Leakage

The existing compressors will be refurbished and not transferred to another activity. Therefore, leakages are not to be considered.

B.1.2.9 Emission Reductions

Emission reductions due to this sub-project activity during the year y are calculated as the difference between the baseline and the project emissions. The formulae can be reported as follow:

$$ER_{SP2,y} = BE_{SP2,y} - PE_{SP2,y} \qquad \text{(a.6)}$$

Where:

$ER_{SP2,Y}$ = Emission reduction in year y for implementation of Sub-Project #2 [tCO_2];

$BE_{SP2,Y}$ = Baseline emissions in year y [tCO_2];

$PE_{SP2,Y}$ = Project emissions in year y for implementation of Sub-Project #2 [tCO_2];

B.1.3 SP3 - Switch fuel from NG to COG+BFG+NG mixtures

B.1.3.1 Source

In spite of the fact that there are not approved methodologies fully applicable to set baseline and demonstrate additionality of the present sub-project, the baseline setting described hereinafter make some reference to the approved consolidated methodology ACM0009 "Consolidated baseline methodology for fuel switching from coal or petroleum fuel to natural gas – Version 03".

This baseline setting also refers to the latest approved versions of the following tools:

- Guidelines for completing the proposed new baseline and monitoring methodologies – version 06.2;
- Combined tool to identify the baseline scenario and demonstrate additionality – version 02.1;
- Tool for the demonstration and assessment of additionality – version 04;

B.1.3.2	*Selected approach*

The selected approach from paragraph 48 of the CDM modalities and procedures is "existing actual or historical emissions, as applicable".

B.1.3.3	*Applicability conditions*

The baseline setting for this sub-project refers to the methodology ACM0009 since it is related to fuel-switching projects. Differently form the ACM0009, the proposed sub-project envisages the replacement of natural gas with waste gas, while the approved methodology envisages the switching from coal to natural gas.

The baseline setting described herein after is applicable under the following conditions:

- Prior to the implementation of the project activity, the only direct emission source was the combustion of natural gas;
- Regulations do no constrain the industrial facility generating waste gas from using the same amount of natural gas being used prior to the implementation of this sub-project;
- Regulations do not require the use of BFG or COG in the element process;
- The project activity does not increase the capacity of thermal output or lifetime of the element included in the project boundaries;
- BFG and COG would otherwise be flared to the atmosphere;
- The proposed project activity does not result in integrated process change.

B.1.3.4	*Sub-project boundaries*

The project boundaries cover CO_2 emissions associated with natural gas combustion in each single equipment subject of the fuel switching. The project boundaries are applied to both baseline and project emissions.

For the purpose of determining baseline and the project activity emissions, carbon dioxide emissions from the combustion of natural gas in each single equipment subject of the fuel switching will be included.

The geographical extent project boundaries include the following:

1) the sections of the plant where waste gas is generated (Blast Furnaces and Coke oven Batteries);
2) the sections of the plant where such waste gas will replace natural gas (Rolling Shops 3; Rotary Kilns);

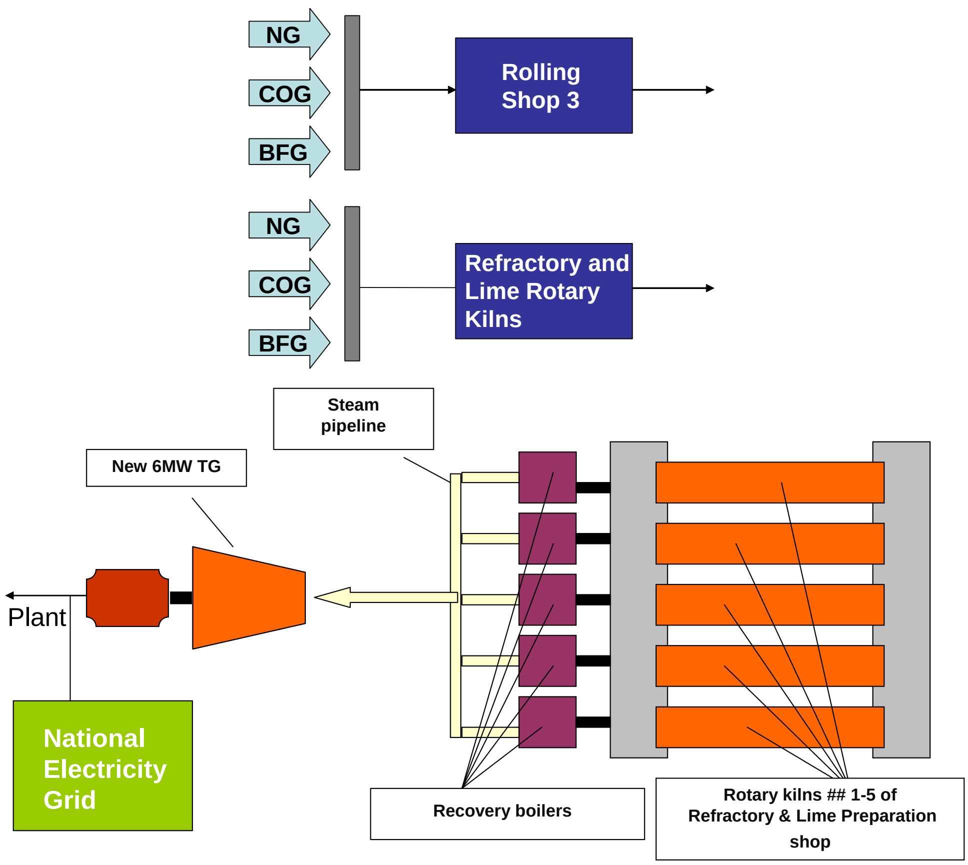


Figure 11: Sub-Project #3 boundaries

Overview of emission sources included in or excluded from the project boundary is provided in the following table:

	Source	Gas	Included?	Justification/ explanation
Baseline	Natural Gas consumption	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
Project Activity	Natural Gas consumption	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification: conservative assumption
		N_2O	Excluded	Excluded for simplification: conservative assumption
	COG and BFG	CO_2	Excluded	BFG and COG are zero emission fuels
		CH_4	Excluded	BFG and COG are zero emission fuels
		N_2O	Excluded	BFG and COG are zero emission fuels

B.1.3.5 Identification of the baseline scenario and demonstration of additionality

The next two steps foresee the identification of the baseline scenario and the demonstration of additionality.

The "tool for demonstration and assessment of additionality", the "Combined tool to identify the baseline scenario and demonstrate additionality", and where possible, the ACM0009, have been used to identify the main principles underlying the baseline setting, additionality, and monitoring. While identifying the baseline and project emissions, the general principles of Annex B of 16/CP.7 (in particular: (i) project-specific approach, (ii) taking conservative assumption, and (iii) taking into account relevant policies) have been adhered too.

Applicability

The "Combined tool to identify the baseline scenario and demonstrate additionality – Version 2.1" provides for a step-wise approach to identify the baseline scenario and simultaneously demonstrate additionality.

This Project envisages that:

- Fuel switch at existing installations are operated by project participants;

Since all the potential alternative scenarios identified in the following paragraphs, are under control of the project participants, the present methodology is fully applicable to the proposed Sub-Project.

Approach to select the baseline scenario and assess additionality

Please refer to paragraph §B.1.1.5

STEP 1. Identification of alternative scenarios

Step 1a. Define alternative scenarios to the proposed JI project activity.

The baseline alternatives to be considered can be summarized as follow:

a) Continuation of the existing situation

This scenario foresees the continuation of activities under a business-as-usual scenario. In absence of the project activity, AMKR could continue with the existent practice of natural gas burning. The waste gas generated by the process would continue not be used.

b) Implementation of the proposed Project activity without being registered as a JI

This scenario foresees the fuel switching within the project boundaries even in absence of the JI incentives.

c) Use of alternative technologies rather than those proposed by the Project participant

This scenario foresees the production of the same amount of thermal energy foreseen in this sub-project, with alternative fuels and/or technologies than those proposed.

Step 1b. Consistency with mandatory applicable laws and regulations

All the alternatives defined in the Step 1 above, are in compliance with all mandatory applicable legal and regulatory requirements.

The following step foresees the project developer to choose between the Barrier and the investment analysis. Even if it is not necessary both the two paths have been developed in order to better provide evidence of the baseline and additionality of this project.

STEP 2. Barrier analysis

Sub-step 2a. Identify barriers that would prevent the implementation of alternatives scenarios:

Barriers that would prevent the implementation of alternative scenarios are the same as described at paragraph §B.1.1.5, Sub-step 2a and, for this reason, they are not repeated here.

Sub-step 2b. Eliminate alternative scenarios which are prevented by the identified barriers

The alternative c) "Use of alternative technologies and fuel rather than those proposed by the project participant" faces a specific technological barrier. ArcelorMittal has significant experience in restructuring large-scale operations. The Company will be able to draw on the collective experience and expertise of ArcelorMittal.

The use of different technologies rather than those proposed by the project participants could lead to an unacceptable risk of equipment disrepair, malfunctioning or other underperformances due to the lack of skills and experience in the relevant geographic area. Moreover, there is no logical solution for using any other alternative type of fuel than those proposed by AMKR.

Thus, there are not acceptable reasons for implementing different technologies than those proposed by the Company. Moreover, the measures proposed for the project shall lead to consistent improvement in the energy efficiency of the operations.

Therefore, this alternative has been excluded from further considerations.

The two remaining scenarios that can be viewed as alternative scenarios are: the continuation of the existing situation or, the proposed intervention without the JI incentive.

The alternative a) "continuation of existing situation" does not require any investment by the Company and therefore is not affected by the barriers listed above.

Moreover, there are not technical, sectoral, legislative, economical, and environmental key factors that oblige to carry out any change in the business-as-usual-operations, as:

- there is no need to use alternative fuels. Natural gas availability could permit to continue to cover the thermal demand of the plant;
- steel industry sector of Ukraine was created during the Soviet era, when energy efficiency was not a priority for facilities. ArcelorMittal's competitors playing on the Ukrainian steel market continue to use the aged equipment without rehabilitation programmes;
- the facility complies with the current regulations and no relevant development in legislation within the Host Country is foreseen in the next years;
- the Company is one of the lowest cost steel producers in the world. It has established markets in emerging regions which have a particularly high growth in steel demand;

- no environmental issues are associated with the continuation of the current operations.

The alternative b) “Implementation of all the proposed intervention without the JI incentive” faces both prevailing practice and financial barriers.

Reasons why “Implementation of the proposed intervention without the JI incentive” faces prevailing practice and financial barriers are the same as described at §B.1.1.5, and are not repeated here.

Based on all the considerations reported at §B.1.1.5, the only alternative scenario to the project activity not prevented by any barrier is:

a) Continuation of the existing situation

The “Combined tool to identify the baseline scenario and demonstrate additionality” reports that: “*if there is only one alternative scenario that it is not prevented by any barrier, and this alternative is* ***not*** *the proposed project undertaken without being registered as a JI project activity, then this alternative scenario is identified as baseline scenario and the “step 3” can be avoided*”.

Based on this assumption “Continuation of existing situation” represents the baseline scenario for the proposed JI project.

STEP 3. Investment analysis

Even if “Continuation of existing situation” is the only alternative remaining scenario, and therefore can be considered as the baseline for this sub-project, in order to provide with more evidence about the additionality of the project, here below an investment analysis is provided. This specific sub-section takes reference to the “tool for the demonstration and assessment of additionality”.

Sub-step 3a.Determination of appropriate analysis method

For the determination of the appropriate analysis method please refer to §B.1.1.5, sub-step3a.

Sub-step 3b.Calculation and comparison of financial indicators

The main drivers of the financial analysis for the proposed sub-project activity are all relevant costs for implementation of the project, and the revenues (excluding Carbon Credit revenues) coming from the energy savings associated with the project implementation.

Since ArcelorMittal is the only project developer, the calculated financial parameters have been compared with the corporate internal benchmark (Weighted average capital cost of the company, WACC). In performing such analysis it has to be taken into account that ArcelorMittal has never implemented energy efficiency investments in Ukraine prior to this project activity.

The WACC usually taken as reference by the company is 15%. However, the “tool for the demonstration and assessment of additionality” reports that the project risk have to be included through the cash flow pattern. In order to cover the risk factor associated to invest in such kind on countries the Corporate WACC was reasonably set around 20%, lower than the average discount rates provided by banks providing funds for energy investments in Ukraine usually higher than 21-23%.

The economic indicators for the proposed sub-project without JI revenues have been calculated utilizing financial criteria developed during the PDD preparation, and by running a preliminary CAPEX program that is provided as annex to the present document.

In implementing the model, the following assumptions have been considered:

- Electricity and natural gas prices are the most updated values available (end of 2007);
- O&M costs are rough estimations based on energy managers' experience and take into account only major expected expenses (conservative assumption);
- Price of carbon credits has been fixed at 24.5€/ERU.

The main economic inputs for the present sub-project can be summarized as follow:

INPUT DATA		
Investment	10,444	kEur
Additional O&M costs	38	kEur
Annual saving	2,675	kEur
Life time	15	Yrs
Corporation Tax	25	%
Discount Rate / WACC	20	%

Table 16: Financial inputs for Sub-Project 3

The main results of the financial analysis can be summarized as follow:

RESULTS	Without JI		With JI	
IRR	17.3	%	22.4	%
NPV	-1,219	kEur	1,044	kEur
Payback time	5.3	Yrs	4.2	Yrs

Table 17: Financial indicators for Sub-Project 3

The financial results show that the expected project profit is not sufficient to cover the corporate benchmark required for this project. On the other hand, carbon credit revenues would permit to cover all additional risk factor associated with project implementation in Ukraine.

Sub-step 3c. Sensitivity Analysis

A sensitivity analysis of the proposed sub-project was made in order to check the robustness of the financial results. Parameters that more likely could change in the future are the price of natural gas, the expected natural gas saving, the total investment costs and the price of carbon credits.

Sensitivity Analysis	IRR Without JI		IRR With JI	
Natural gas savings up by10%	19.2	%	24.4	%
Natural gas price up by 10%	19.2	%	24.4	%

Investment 10% down	19.4	%	25.1	%
Carbon Credit price 10% down	17.3	%	21.9	%

Table 18: Sensitivity Analysis for Sub-Project 3

The results show that the sub-project scenario is not significantly affected by any of the parameters object of the present sensitivity analysis.

Since the project-activity has a less favourable indicator (lower IRR) than the benchmark, this sensitivity analysis together with the financial analysis explained above, confirms the results of the barrier analysis that "Continuation of existing situation" represents the baseline scenario for the proposed sub-project.

Impact of JI registration

Revenues coming from selling of carbon credits could permit to reach the Company benchmark and to cover all the additional risks associated with the implementation of the project in Ukraine.

STEP 4. Common practice analysis

Considerations on how this sub-project have not to be considered common practice are the same as those included at §B.1.1.5-STEP 4, and are not repeated here.

To conclude, based on the "Combined tool to identify the baseline scenario and demonstrate additionality" the proposed Sub-Project is not to be considered common practice and it is additional to what would otherwise occur.

B.1.3.6 Baseline Emissions

Baseline emissions include CO_2 emissions from the combustion of the quantity of natural gas that would be used in the element processes included in the project boundary in absence of the proposed project activity. Baseline emissions are calculated based on the quantity of natural gas that would be combusted in each element process i in the absence of the project activity and respective net calorific value and CO_2 emission factor. No emissions are associated to the combustion of BFG and COG, since emission factor for gases otherwise flared to the atmosphere can be considered equal to zero.

The quantity of natural gas that would be used in the absence of the project activity in an element process *i* is calculated based on the monitored quantity of natural gas, COG and BFG combusted in the element process and the relation of the net calorific values, between the project and the baseline scenarios.

Emission Factor (EF) of 1.9 Kg per m^3 of natural gas in determining the amount of emission reductions for fuel combustion was used. This value is calculated starting from the IPCC value of 0.0561 tCO_2/GJ and considering the Net Calorific Value (NCF) for natural gas provided by the plant, equal to 8,106 $kcal/Nm^3$.

Conservative value of 100% efficiency in the combustion was used, and for this reason was not included in the calculations.

The Baseline emissions for the year y are determined as follow:

$$BE_{SP3,y} = NG_{SP3,BS,y} \cdot NCV_{NG} \cdot EF_{NG,y} \quad \text{(a.7)}$$

$$NG_{SP3,BS,y} = \sum_i \left(NG_{SP3,PS,y,i} \cdot NCV_{NG} + COG_{SP3,PS,y,i} \cdot NCV_{COG} + BFG_{SP3,PS,y,i} \cdot NCV_{BFG} \right) / \ NCV_{NG} \quad \text{(a.8)}$$

Where:

$BE_{SP3,Y}$ = Baseline emissions in year y for implementation of Sub-Project #3 [tCO_2];

$NG,_{SP3,BS,y}$ = Natural Gas consumption in the plant sections object of the Sub-Project #3 (baseline scenario) [Nm^3/y];

NCV_{NG} = Net Calorific Value for NG [kcal/ Nm^3].

$EF_{NG,y}$ = Emission Factor for NG combustion in year y [tCO_2/GJ].

$NG,_{SP3,PS,y,i}$ = Natural Gas consumption in the element process i (Project scenario) [Nm^3/y];

$COG,_{SP3,PS,y,i}$ = COG consumption in the element process i (Project scenario) [Nm^3/y];

NCV_{COG} = Net Calorific Value for COG [kcal/ Nm^3].

$BFG,_{SP3,PS,y,i}$ = BFG consumption in the element process i (Project scenario) [Nm^3/y];

NCV_{BFG} = Net Calorific Value for BFG [kcal/ Nm^3].

Details of baseline emissions calculations are included in section D and annex 2 of the present PDD.

B.1.3.7 Project Emissions

Project emissions include CO_2 emissions from the combustion of natural gas in all element processes[12] *i* in the project scenario. Project emissions are calculated based on the quantity of natural gas combusted in all element process *i* on the net calorific value and on CO_2 emission factor for natural gas. No emissions are associated to the combustion of BFG and COG, since emission factor for gases otherwise flared to the atmosphere can be considered equal to zero.

Emission Factor (EF) of 1.9 Kg per m^3 of natural gas in determining the amount of emission reductions for fuel combustion was used. This value is calculated starting from the IPCC value of 0.0561 tCO_2/GJ and considering the Net Calorific Value (NCF) for natural gas provided by the plant, equal to 8,106 $kcal/Nm^3$.

$$PE_{SP3,y} = NG_{SP3,PS,y} \cdot NCV_{NG} \cdot EF_{NG,y} \quad \text{(a.9)}$$

$$NG_{SP3,PS,y} = \sum_i NG_{SP3,PS,y,i} \quad \text{(a.10)}$$

Where:

$PE_{SP3,Y}$ = Project emissions in year y for implementation of Sub-Project #3 [tCO_2];

$NG_{SP3,PS,y}$ = Natural Gas consumption in the plant sections object of the Sub-Project #3 [Nm^3/y];

$NG_{SP3,PS,y,i}$ = Natural Gas consumption in the element process i in the year y [Nm^3/y];

NCV_{NG} = Net Calorific Value for NG [kcal/ Nm^3].

$EF_{NG,y}$ = Emission Factor for NG combustion in year y [tCO_2/GJ];

Details of project emissions calculations are included in section D and annex 2 of the present PDD.

[12] Fuel combustion in a single equipment at one point of the process included in the project boundaries.

B.1.3.8 Leakage

Proposed sub-project activity leads to reduction in natural gas consumption. For this reason, the only leakages that could be detected due to the implementation of the proposed project activities is possible reduction in leakages from extraction, processing, liquefaction, transportation and distribution of natural gas.

Since, in order to be conservative, these leakages have not been considered in the calculations, this section is not applicable.

B.1.3.9 Emission Reductions

Emission reductions due to this sub-project activity during the year y are calculated as the difference between the baseline and the project emissions. The formulae can be reported as follow:

$$ER_{SP3,y} = BE_{SP3,y} - PE_{SP3,y} \quad \text{(a.11)}$$

Where:

$ER_{SP3,Y}$ = Emission reduction in year y for implementation of Sub-Project #3 [tCO_2];

$BE_{SP3,Y}$ = Baseline emissions in year y [tCO_2];

$PE_{SP3,Y}$ = Project emissions in year y for implementation of Sub-Project #3 [tCO_2];

B.1.4 SP4 - Refurbishment of Electricity Distribution System

B.1.4.1 Source

In spite of the fact that there are not approved methodologies fully applicable to set baseline and demonstrate additionality of the present sub-project, the baseline setting described hereinafter make reference, where possible, to the following:

a)-simplified baseline monitoring methodology AMS-II.A “Supply side energy efficiency improvements-transmission and distribution – Version 09”, and

b)-approved baseline and monitoring methodology AM0067 “Methodology for installation of energy efficiency transformers in a power distribution grid – Version 01”.

This baseline setting also refers to the latest approved versions of the following tools:

- Guidelines for completing the proposed new baseline and monitoring methodologies – version 06.2;
- Combined tool to identify the baseline scenario and demonstrate additionality – version 02.1;
- Tool for the demonstration and assessment of additionality – version 04;
- “Standardized emission factor for the Ukrainian electricity grid”, version 5 dated 2 February 2007. This document is reported in annex 2 for consultation.

B.1.4.2 Selected approach

The selected approach from paragraph 48 of the CDM modalities and procedures is “existing actual or historical emissions, as applicable”.

B.1.4.3 *Applicability conditions*

The baseline setting for this sub-project can refer to the AMS-II.A since this sub-project comprises measures to improve the energy efficiency of an electricity transmission and distribution system by up to 60 GWh_e per year. The sub-project foresees the installation of filter compensating devices in sub-stations n.3, 5, 8, 17, 20. The filters are applied to existing transmission and distribution systems in order to increase the current power factor and therefore reduce the electrical losses of the grid.

The methodology is applicable under the following conditions:

- Regulations do no constrain the industrial facility to reduce the power factor;
- The credits can be claimed for minimum of the following periods: i) the remaining lifetime of equipment currently being used; ii) credit period.

B.1.4.4 *Sub-project boundaries*

The geographical extent project boundaries include the physical, geographical boundary of the portion of the electrical transmission and distribution system where the energy efficiency filter compensating devices are installed, and the National electricity grid where indirect emission reduction will take place.

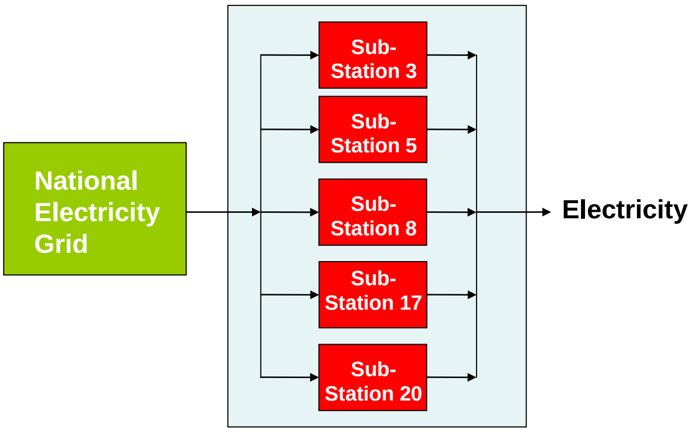


Figure 12: Sub-Project #4 boundaries

Overview of emission sources included in or excluded from the project boundary is provided in the following table:

	Source	Gas	Included?	Justification/ explanation
Baseline	Electricity generation	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification: conservative assumption
		N_2O	Excluded	Excluded for simplification: conservative assumption
Project Activity	Electricity generation	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification

B.1.4.5 Identification of the baseline scenario and demonstration of additionality

The next two steps foresee the identification of the baseline scenario and the demonstration of additionality.

The "tool for demonstration and assessment of additionality", the "Combined tool to identify the baseline scenario and demonstrate additionality", and, where possible, the AMS-II.A and the AM0067, have been used to identify the main principles underlying the baseline setting, additionality, and monitoring. While identifying the baseline and project emissions, the general principles of Annex B of 16/CP.7 (in particular: (i) project-specific approach, (ii) taking conservative assumption, and (iii) taking into account relevant policies) have been adhered too.

Applicability

The "Combined tool to identify the baseline scenario and demonstrate additionality – Version 2.1" provides for a step-wise approach to identify the baseline scenario and simultaneously demonstrate additionality.

This Project envisages that:

- Energy improvements at existing installations are operated by project participants.

Since all the potential alternative scenarios identified in the following paragraphs, are under control of the project participants, the present methodology is fully applicable to the proposed Sub-Project.

Approach to select the baseline scenario and assess additionality

Please refer to paragraph §B.1.1.5.

STEP 1. Identification of alternative scenarios

Step 1a. Define alternative scenarios to the proposed JI project activity.

Baseline alternatives to be considered can be summarized as follow:

a) Continuation of the existing situation

This scenario foresees the continuation of activities under a business-as-usual scenario. In absence of the project activity, AMKR could continue with the existent practice of electricity transmission and distribution. The filter compensating devices would not be installed and the power factor would continue to be low.

b) Implementation of the proposed Project activity without being registered as a JI

This scenario foresees the installation of filter compensating devices in sub-stations n.3, 5, 8, 17, 20 even in absence of the JI incentives.

c) Use of alternative technologies rather than those proposed by the Project participant

This scenario foresees the reduction of the power factor in the proposed sub-stations with alternative technologies than those proposed by the project participants.

Step 1b. Consistency with mandatory applicable laws and regulations

All the alternatives defined in the Step 1 above are in compliance with all mandatory applicable legal and regulatory requirements.

The following step foresees the project developer to choose between the Barrier and the investment analysis. Even if it is not necessary, both the two paths have been developed in order to better provide evidence of the baseline and additionality of this sub-project.

STEP 2. Barrier analysis

Sub-step 2a. Identify barriers that would prevent the implementation of alternatives scenarios:

Barriers that would prevent the implementation of alternative scenarios are the same as described at paragraph §B.1.1.5, Sub-step 2a and, for this reason, they are not repeated here.

Sub-step 2b. Eliminate alternative scenarios which are prevented by the identified barriers

The alternative c) "Use of alternative technologies rather than those proposed by the project participant" faces a specific technological barrier. ArcelorMittal has significant experience in restructuring large-scale operations. The Company will be able to draw on the collective experience and expertise of ArcelorMittal.

Nonetheless, the use of different technologies rather than those proposed by the project participants could lead to an unacceptable risk of equipment disrepair, malfunctioning or other underperformances due to the lack of skills and experience in the relevant geographic area.

Thus, there are not acceptable reasons for implementing different technologies than those proposed by the Company. Moreover, the measures proposed for the project shall lead to consistent improvement in the energy efficiency of the operations.

Therefore, this alternative has been excluded from further considerations.

The two remaining scenarios that can be viewed as alternative scenarios are: the continuation of the existing situation or the proposed intervention without the JI incentive.

The alternative a) "continuation of existing situation" does not require any investment by the Company and therefore is not affected by the barriers listed above.

Moreover, there are not technical, sectoral, legislative, economical, and environmental key factors that oblige to carry out any change in the business-as-usual-operations, as:

- no equipments will be replaced by implementing the Project activities. Current electric distribution system is still workable for a long time period;
- steel industry sector of Ukraine was created during the Soviet era, when energy efficiency was not a priority for facilities. ArcelorMittal's competitors playing on the Ukrainian steel market continue to use the aged equipment without rehabilitation programmes;
- the facility complies with the current regulations and no relevant development in legislation within the Host Country is foreseen in the next years;
- the Company is one of the lowest cost steel producers in the world. It has established markets in emerging regions which have a particularly high growth in steel demand;

- no environmental issues are associated with the continuation of the current operations.

The alternative b) "Implementation of all the proposed intervention without the JI incentive" faces both prevailing practice and financial barriers.

Reasons why "Implementation of the proposed intervention without the JI incentive" faces prevailing practice and financial barriers are the same as described at §B.1.1.5, and are not repeated here.

Based on all the considerations reported at §B.1.1.5, the only alternative scenario to the project activity not prevented by any barrier is:

a) Continuation of the existing situation

The "Combined tool to identify the baseline scenario and demonstrate additionality" reports that: "*if there is only one alternative scenario that it is not prevented by any barrier, and this alternative is* ***not*** *the proposed project undertaken without being registered as a JI project activity, then this alternative scenario is identified as baseline scenario and the "step 3" can be avoided*".

Based on this assumption "Continuation of existing situation" represents the baseline scenario for the proposed JI project.

STEP 3. Investment analysis

Even if "Continuation of existing situation" is the only alternative remaining scenario, and therefore can be considered as the baseline for this sub-project, in order to provide with more evidence about the additionality of the project, here below an investment analysis is provided. This specific sub-section takes reference to the "tool for the demonstration and assessment of additionality".

Sub-step 3a.Determination of appropriate analysis method

For the determination of the appropriate analysis method please refer to §B.1.1.5., sub-step3a.

Sub-step 3b.Calculation and comparison of financial indicators

The main drivers of the financial analysis for the proposed sub-project activity are all relevant costs for implementation of the project, and the revenues (excluding Carbon Credit revenues) coming from the energy savings associated with the project implementation.

Since ArcelorMittal is the only project developer, the calculated financial parameters have been compared with the corporate internal benchmark (Weighted average capital cost of the company, WACC). In performing such analysis it has to be taken into account that ArcelorMittal has never implemented energy efficiency investments in Ukraine prior to this project activity.

The WACC usually taken as reference by the company is 15%. However, the "tool for the demonstration and assessment of additionality" reports that the project risk have to be included through the cash flow pattern. In order to cover the risk factor associated to invest in such kind on countries the Corporate WACC was reasonably set around 20%, lower than the average discount rates provided by banks providing funds for energy investments in Ukraine usually higher than 21-23%.

The economic indicators for the proposed sub-project without JI revenues have been calculated utilizing financial criteria developed during the PDD preparation, and by running a preliminary CAPEX program that is provided as annex to the present document.

In implementing the model, the following assumptions have been considered:

- Electricity and natural gas prices are the most updated values available (end of 2007);
- O&M costs for this sub-project have been conservatively considered equal to zero;
- The costs saving due to the reactive power level reduction have been included as annual saving for this project.
- Price of carbon credits has been fixed at 24.5€/ERU.

AMKR is currently paying about 600,000 UAH per year due to the reactive power production at their sub-station. Increasing of the power factor would lead to costs savings. Cost for reactive power can be estimated at about 0.89 €/MVarh with an expected total annual cost saving of 435,000 €. Complete calculation is included as Annex 2 in the baseline worksheet.

The main economic inputs for the present sub-project can be summarized as follow:

INPUT DATA		
Investment	10,667	kEur
Additional O&M costs	0	kEur
Annual saving	2,161	kEur
Life time	15	Yrs
Corporation Tax	25	%
Discount Rate / WACC	20	%

Table 19: Financial inputs for Sub-Project 4

The main results of the financial analysis can be summarized as follow:

RESULTS	Without JI		With JI	
IRR	14.7	%	20.0	%
NPV	-2,259	kEur	-11	kEur
Payback time	5.9	Yrs	4.7	Yrs

Table 20: Financial indicators for Sub-Project 4

The financial results show that the project, if compared with the benchmark, could be considered "profitable" only if additional revenues from the selling of carbon credits are included in the analysis.

Sub-step 3c. Sensitivity Analysis

A sensitivity analysis of the proposed sub-project was made in order to check the robustness of the financial results. Parameters that more likely could change in the future are the price of electricity, the expected electricity savings, the total investment costs, the price of carbon credits, and the cost for reactive power.

Sensitivity Analysis	IRR Without JI	IRR With JI

Electricity savings up by10%	16.2	%	21.5	%
Electricity Price up by 10%	16.2	%	21.5	%
Investment 10% down	16.7	%	22.8	%
Carbon Credit price 10% down	14.7	%	19.4	%
Reactive power tariff 10% up	15.1	%	20.4	%

Table 21: Sensitivity Analysis for Sub-Project 4

The results show that the sub-project scenario is not significantly affected by any of the parameters object of the present sensitivity analysis.

Since the project-activity has a less favourable indicator (lower IRR) than the benchmark, this sensitivity analysis together with the financial analysis explained above, confirms the results of the barrier analysis that "Continuation of existing situation" represents the baseline scenario for the proposed sub-project.

Impact of JI registration

Revenues coming from selling of carbon credits could permit to reach the Company benchmark and to cover all the additional risks associated with the implementation of the project in Ukraine.

STEP 4. Common practice analysis

Considerations on how this sub-project have not to be considered common practice are the same as those included at §B.1.15-STEP 4, and are not repeated here.

To conclude, based on the "Combined tool to identify the baseline scenario and demonstrate additionality" the proposed Sub-Project is not to be considered common practice and it is additional to what would otherwise occur.

B.1.4.6 Baseline Emissions

The energy baseline is the technical losses of electric energy within the project boundaries calculated as the measured performance of the existing equipment multiplied by the average electric transmission losses of the Ukrainian electricity Grid[13]. The formulae can be summarized as follow:

$$EC_{SP4,BS,y} = \sum_i \frac{rp_i \cdot o_i \cdot UTL}{tg\,\varphi_i} \qquad (a.12)$$

Where:

$EC_{SP4,BS,y}$ = energy baseline in year y in kWh/y;

rp_i = average reactive power for the sub-station "ith" where the energy efficiency equipment has been installed in year y in kVarh/y;

o_i = operating hours in h/y;

Cosφ = average power factor for the sub-station "ith" where the energy efficiency equipment has been installed in year y;

UTL= Ukrainian electricity transmission losses from the grid in %.

[13] http://www.eia.doe.gov/emeu/cabs/Ukraine/Electricity.html

The Baseline emissions for the year y are determined by multiplying the energy baseline with the emission coefficient of the Ukrainian electricity grid expressed in t CO_2/MWh. This coefficient for the Ukrainian Electricity Grid refers to the document "Standardized emission factor for the Ukrainian electricity grid", version 5 dated 2 February 2007. The complete document is included in Annex 2 for consultation.

$$BE_{SP4,y} = EC_{SP4,BS,y} \cdot EF_{el,y} \quad (a.13)$$

Where:

$BE_{SP4,y}$ = Baseline emissions in year y without implementation of Sub-Project #4 [tCO_2];

$EF_{el,y}$ = Carbon Emission Factor for Ukrainian grid in year y [tCO_2/MWh];

Details of baseline emissions calculations are included in section D and annex 2 of the present PDD.

B.1.4.7 Project Emissions

The energy project consumption is the active electric energy within the project boundaries calculated as the measured performance of the existing equipment with installed filter compensating devices, multiplied by the average electric transmission losses of the Ukrainian electricity Grid. The formulae can be summarized as follow:

$$EC_{SP4,PS,y} = \sum_i \frac{rp_i \cdot o_i \cdot UTL}{tg\varphi_i} \quad (a.14)$$

Where:

$EC_{SP4,PS,y}$ = annual energy project consumption in year y in kWh/y;

Rp_i = average reactive power for the sub-station "ith" where the energy efficiency equipment has been installed in year y in kVarh/y;

O_i = operating hours in h/y;

Cosφ = average power factor for the sub-station "ith" where the energy efficiency equipment has been installed in year y;

UTL= Ukrainian electricity transmission losses from the grid in %.

The Project emissions for the year y are determined by multiplying the energy project consumption with the emission coefficient of the Ukrainian electricity grid expressed in t CO_2/MWh. This coefficient for the Ukrainian Electricity Grid refers to the document "Standardized emission factor for the Ukrainian electricity grid", version 5 dated 2 February 2007. The complete document is included in Annex 2 for consultation.

$$PE_{SP4,y} = EC_{SP4,PS,y} \cdot EF_{el,y} \quad (a.15)$$

Where:

$PE_{SP4,y}$ =Project emissions in year y after implementation of Sub-Project #4 [tCO_2];
$EC_{SP4,PS,y}$ = annual energy project consumption in year y in MWh/y;

$EF_{el,y}$ = Carbon Emission Factor for Ukrainian grid in year y [tCO_2/MWh];

Details of project emissions calculations are included in section D and annex 2 of the present PDD.

B.1.4.8 Leakage

Proposed sub-project activity leads to reduction in electricity consumption. For this reason, the only leakages that could be detected due to the implementation of the proposed project activities would lead to possible reduction in leakages from electricity transportation.

Since, in order to be conservative, these leakages have not been considered in the calculations, this section is not applicable.

B.1.4.9 Emission Reductions

Emission reductions due to this sub-project activity during the year y are calculated as the difference between the baseline and the project emissions. The formulae can be reported as follow:

$$ER_{SP4,y} = BE_{SP4,y} - PE_{SP4,y} \quad (a.16)$$

Where:

$ER_{SP4,Y}$ = Emission reduction in year y for implementation of Sub-Project #4 [tCO_2];

$BE_{SP4,Y}$ = Baseline emissions in year y [tCO_2];

$PE_{SP4,Y}$ = Project emissions in year y for implementation of Sub-Project #4 [tCO_2];

B.1.5 SP5 - New gas burner Installation

B.1.5.1 Source

In spite of the fact that there are not approved methodologies fully applicable to set baseline and demonstrate additionality of the present sub-project, the baseline setting described hereinafter make some reference to the approved consolidated methodology ACM0009 – Version 03 "Consolidated baseline methodology for fuel switching from coal or petroleum fuel to natural gas".

This baseline setting also refers to the latest approved versions of the following tools:

- Guidelines for completing the proposed new baseline and monitoring methodologies – version 06.2;
- Combined tool to identify the baseline scenario and demonstrate additionality – version 02.1;
- Tool for the demonstration and assessment of additionality – version 04;

B.1.5.2 Selected approach

The selected approach from paragraph 48 of the CDM modalities and procedures is "existing actual or historical emissions, as applicable".

B.1.5.3 Applicability conditions

The baseline setting for this sub-project refers to the methodology ACM0009 since it is related to fuel-switching projects. Differently form the ACM0009, the proposed sub-project envisages the replacement of natural gas with waste gas, while the approved methodology envisages the switching from coal to natural gas.

The baseline setting described herein after is applicable under the following conditions:

- Prior to the implementation of the project activity, the only direct emission source was the combustion of natural gas;
- Regulations do no constrain the industrial facility generating waste gas from using the same amount of natural gas being used prior to the implementation of this sub-project;
- Regulations do not require the use of BFG or COG in the element process;
- The project activity does not increase the capacity of thermal output or lifetime of the element included in the project boundaries;
- BFG and COG would otherwise be flared to the atmosphere;
- The proposed project activity does not result in integrated process change.

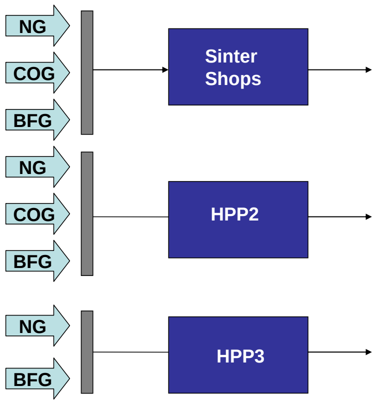
B.1.5.4 Sub-project boundaries

The project boundaries cover CO_2 emissions associated with natural gas combustion in each single equipment subject of the fuel switching. The project boundaries are applied to both baseline and project emissions.

For determining both baseline and the project activity emissions, carbon dioxide emissions from the combustion of natural gas in each single equipment subject of the fuel switching will be included.

The geographical extent project boundaries include the following:

1) the sections of the plant where waste gas is generated (Blast Furnaces and Coke oven Batteries);
2) the sections of the plant where such waste gas will replace natural gas (Sinter Shop, HPP2, and HPP3) for this reason boundaries of the measure #7 have been included in the boundaries of this sub-project;



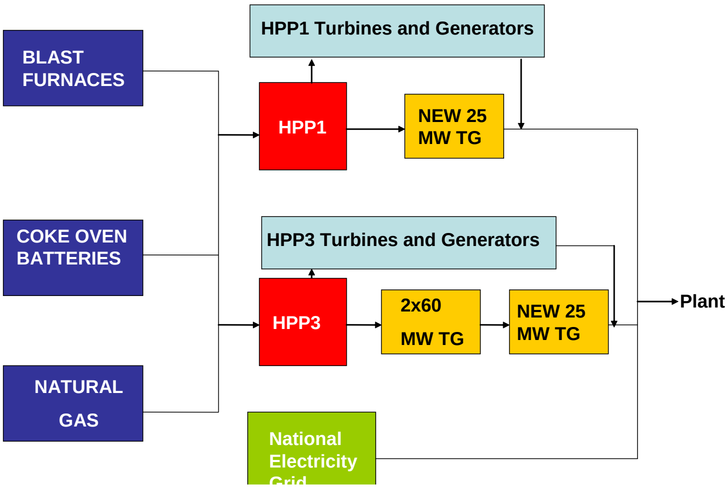


Figure 13: Sub-Project #5 boundaries

Overview of emission sources included in or excluded from the project boundary is provided in the following table:

	Source	Gas	Included?	Justification/ explanation
Baseline	Natural Gas consumption	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	COG and BFG	CO_2	Excluded	BFG and COG are zero emission fuels
		CH_4	Excluded	BFG and COG are zero emission fuels
		N_2O	Excluded	BFG and COG are zero emission fuels
Project Activity	Natural Gas consumption	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification: conservative assumption
		N_2O	Excluded	Excluded for simplification: conservative assumption
	COG and BFG	CO_2	Excluded	BFG and COG are zero emission fuels
		CH_4	Excluded	BFG and COG are zero emission fuels
		N_2O	Excluded	BFG and COG are zero emission fuels

B.1.5.5 Identification of the baseline scenario and demonstration of additionality

The next two steps foresee the identification of the baseline scenario and the demonstration of additionality.

The “tool for demonstration and assessment of additionality”, the “Combined tool to identify the baseline scenario and demonstrate additionality”, and where possible, the ACM0009, have been used to identify the main principles underlying the baseline setting, additionality, and monitoring. While identifying the baseline and project emissions, the general principles of Annex B of 16/CP.7 (in particular: (i) project-specific approach, (ii) taking conservative assumption, and (iii) taking into account relevant policies) have been adhered too.

Applicability

The "Combined tool to identify the baseline scenario and demonstrate additionality – Version 2.1" provides for a step-wise approach to identify the baseline scenario and simultaneously demonstrate additionality.

This Project envisages that:

- Fuel switch at existing installations are operated by project participants;

Since all the potential alternative scenarios identified in the following paragraphs, are under control of the project participants, the present methodology is fully applicable to the proposed Sub-Project.

Approach to select the baseline scenario and assess additionality

Please refer to paragraph §B.1.1.5.

STEP 1. Identification of alternative scenarios

Step 1a. Define alternative scenarios to the proposed JI project activity.

The baseline alternatives to be considered can be summarized as follow:

<u>a) Continuation of the existing situation</u>

This scenario foresees the continuation of activities under a business-as-usual scenario. In absence of the project activity, AMKR could continue with the existent practice of natural gas burning. The burners currently installed are still workable, and would continue to work for years.

<u>b) Implementation of the proposed Project activity without being registered as a JI</u>

This scenario foresees the establishment of the new burners and automatic system equipment even in absence of the JI incentives.

c) <u>Use of alternative technologies rather than those proposed by the Project participant</u>

This scenario foresees to reduce the natural gas consumption at HPP2 and HPP3, and at Sinter Shops with alternative technologies compared with those proposed by the project participants.

Step 1b. Consistency with mandatory applicable laws and regulations

All the alternatives defined in the Step 1 above are in compliance with all mandatory applicable legal and regulatory requirements.

The following step foresees the project developer to choose between the Barrier and the investment analysis. Even if it is not necessary, both the two paths have been developed in order to better provide evidence of the baseline and additionality of this project.

STEP 2. Barrier analysis

Sub-step 2a. Identify barriers that would prevent the implementation of alternatives scenarios:

Barriers that would prevent the implementation of alternative scenarios are the same as described at paragraph §B.1.1.5, Sub-step 2a and, for this reason, they are not repeated here.

Sub-step 2b. Eliminate alternative scenarios which are prevented by the identified barriers

The alternative c) "Use of alternative technologies rather than those proposed by the project participant" faces a specific technological barrier. ArcelorMittal has significant experience in restructuring large-scale operations. The Company will be able to draw on the collective experience and expertise of ArcelorMittal.

Nonetheless, the use of different technologies rather than those proposed by the project participants could lead to an unacceptable risk of equipment disrepair, malfunctioning or other underperformances due to the lack of skills and experience in the relevant geographic area. Moreover, there is no logical solution for installing different type of burners than those proposed by AMKR.

Thus, there are not acceptable reasons for implementing different technologies than those proposed by the Company. Moreover, the measures proposed for the project shall lead to consistent improvement in the energy efficiency of the operations and consequent natural gas saving.

Therefore, this alternative has been excluded from further considerations.

The two remaining scenarios that can be viewed as alternative scenarios are: the continuation of the existing situation or, the proposed intervention without the JI incentive.

The alternative a) "continuation of existing situation" does not require any investment by the Company and therefore is not affected by the barriers listed above.

Moreover, there are not technical, sectoral, legislative, economical, and environmental key factors that oblige to carry out any change in the business-as-usual-operations, as:

- There is no need to use alternative fuels. Natural gas availability could permit to continue to cover the thermal demand of the plant;
- steel industry sector of Ukraine was created during the Soviet era, when energy efficiency was not a priority for facilities. ArcelorMittal's competitors playing on the Ukrainian steel market continue to use the aged equipment without rehabilitation programmes;
- the facility complies with the current regulations and no relevant development in legislation within the Host Country is foreseen in the next years;
- the Company is one of the lowest cost steel producers in the world. It has established markets in emerging regions which have a particularly high growth in steel demand;
- no environmental issues are associated with the continuation of the current operations.

The alternative b) "Implementation of all the proposed intervention without the JI incentive" faces both prevailing practice and financial barriers.

Reasons why "Implementation of the proposed intervention without the JI incentive" faces prevailing practice and financial barriers are the same as described at §B.1.1.5, and are not repeated here.

Based on all the considerations reported at §B.1.1.5, the only alternative scenario to the project activity not prevented by any barrier is:

a) Continuation of the existing situation

The "Combined tool to identify the baseline scenario and demonstrate additionality" reports that: "*if there is only one alternative scenario that it is not prevented by any barrier, and this alternative is **not** the proposed project undertaken without being registered as a JI project activity, then this alternative scenario is identified as baseline scenario and the "step 3" can be avoided*".

Based on this assumption "Continuation of existing situation" represents the baseline scenario for the proposed JI project.

STEP 3. Investment analysis

Even if "Continuation of existing situation" is the only alternative remaining scenario, and therefore can be considered as the baseline for this sub-project, in order to provide with more evidence about the additionality of the project, here below an investment analysis is provided. This specific sub-section takes reference to the "tool for the demonstration and assessment of additionality".

Sub-step 3a.Determination of appropriate analysis method

For the determination of the appropriate analysis method please refer to §B.1.1.5., sub-step3a.

Sub-step 3b.Calculation and comparison of financial indicators

The main drivers of the financial analysis for the proposed sub-project activity are all relevant costs for implementation of the project, and the revenues (excluding Carbon Credit revenues) coming from the energy savings associated with the project implementation.

Since ArcelorMittal is the only project developer, the calculated financial parameters have been compared with the corporate internal benchmark (Weighted average capital cost of the company, WACC). In performing such analysis it has to be taken into account that ArcelorMittal has never implemented energy efficiency investments in Ukraine prior to this project activity.

The WACC usually taken as reference by the company is 15%. However, the "tool for the demonstration and assessment of additionality" reports that the project risk have to be included through the cash flow pattern. In order to cover the risk factor associated to invest in such kind on countries the Corporate WACC was reasonably set around 20%, lower than the average discount rates provided by banks providing funds for energy investments in Ukraine usually higher than 21-23%.

The economic indicators for the proposed sub-project without JI revenues have been calculated utilizing financial criteria developed during the PDD preparation, and by running a preliminary CAPEX program that is provided as annex to the present document.

In implementing the model, the following assumptions have been considered:

- Electricity and natural gas prices are the most updated values available (end of 2007);
- Additional O&M costs have been considered equal to zero (conservative assumption);
- Price of carbon credits has been fixed at 24.5€/ERU.

The main economic inputs for the present sub-project can be summarized as follow:

INPUT DATA		
Investment	3,889	kEur

Additional O&M costs	0	kEur
Annual saving	989	kEur
Life time	15	Yrs
Corporation Tax	25	%
Discount Rate / WACC	20	%

Table 22: Financial inputs for Sub-Project 5

The main results of the financial analysis can be summarized as follow:

RESULTS	Without JI		With JI	
IRR	16.1	%	19.8	%
NPV	-671	kEur	-29	kEur
Payback time	5.5	Yrs	4.7	Yrs

Table 23: Financial indicators for Sub-Project 5

The financial results show that the expected project profit is not sufficient to cover the corporate benchmark required for this project. Carbon credit revenues would permit to cover almost all additional risk factor associated with project implementation in Ukraine.

Sub-step 3c. Sensitivity Analysis

A sensitivity analysis of the proposed sub-project was made in order to check the robustness of the financial results. Parameters that more likely could change in the future are the price of natural gas, the expected energy savings, the total investment costs and the price of carbon credits.

Sensitivity Analysis	IRR Without JI		IRR With JI	
NG savings up by10%	17.9	%	21.5	%
NG Price up by 10%	17.9	%	21.5	%
Investment 10% down	18.0	%	22.1	%
Carbon Credit price 10% down	16.1	%	19.5	%

Table 24: Sensitivity Analysis for Sub-Project 5

The results show that the sub-project scenario is not significantly affected by any of the parameters object of the present sensitivity analysis.

Since the project-activity has a less favourable indicator (lower IRR) than the benchmark, this sensitivity analysis together with the financial analysis explained above, confirms the results of the barrier analysis that "Continuation of existing situation" represents the baseline scenario for the proposed sub-project.

Impact of JI registration

Revenues coming from selling of carbon credits could permit to satisfy the Company benchmark and to cover almost all the risks associated with the implementation of the project in Ukraine.

STEP 4. Common practice analysis

Considerations on how this sub-project have not to be considered common practice are the same as those included at §B.1.1.5-STEP 4, and are not repeated here.

To conclude, based on the "Combined tool to identify the baseline scenario and demonstrate additionality" the proposed Sub-Project is not to be considered common practice and it is additional to what would otherwise occur.

B.1.5.6	*Baseline Emissions*

Baseline emissions include CO_2 emissions from the combustion of the quantity of natural gas that would be used in the element processes included in the project boundary in absence of the proposed project activity. Baseline emissions are calculated based on the quantity of natural gas that would be combusted in each element process i in the absence of the project activity and respective net calorific value and CO_2 emission factor. No emissions are associated to the combustion of BFG and COG, since emission factor for gases otherwise flared to the atmosphere can be considered equal to zero.

The quantity of natural gas that would be used in the absence of the project activity in an element process *i* is calculated based on the monitored quantity of natural gas, COG and BFG combusted in the element process and the relation of the net calorific values between the project and the baseline scenarios.

Emission Factor (EF) of 1.9 Kg per m^3 of natural gas in determining the amount of emission reductions for fuel combustion was used. This value is calculated starting from the IPCC value of 0.0561 tCO_2/GJ and considering the Net Calorific Value (NCF) for natural gas provided by the plant, equal to 8,106 $kcal/Nm^3$.

Conservative value of 100% efficiency in the combustion was used, and for this reason was not included in the calculations.

The Baseline emissions for the year y are determined as follow:

$$BE_{SP5,y} = NG_{SP5,BS,y} \cdot NCV_{NG} \cdot EF_{NG,y} \tag{a.17}$$

$$NG_{SP5,BS,y} = \sum_i \left(NG_{SP5,PS,y,i} \cdot NCV_{NG} + COG_{SP5,PS,y,i} \cdot NCV_{COG} + BFG_{SP5,PS,y,i} \cdot NCV_{BFG} \right) / NCV_{NG} \tag{a.18}$$

Where:

$BE_{SP5,Y}$ = Baseline emissions in year y for implementation of Sub-Project #5 [tCO_2];

$NG_{,SP5,BS,y}$ = Natural Gas consumption in the plant sections object of the Sub-Project #5 (baseline scenario) [Nm^3/y];

NCV_{NG} = Net Calorific Value for NG [kcal/ Nm^3].

$EF_{NG,y}$ = Emission Factor for NG combustion in year y [tCO_2/GJ].

$NG_{,SP5,PS,y,i}$ = Natural Gas consumption in the element process i (Project scenario) [Nm^3/y];

$COG_{,SP5,PS,y,i}$ = COG consumption in the element process i (Project scenario) [Nm^3/y];

NCV_{COG} = Net Calorific Value for COG [kcal/ Nm^3].

$BFG_{,SP5,PS,y,i}$ = BFG consumption in the element process i (Project scenario) [Nm^3/y];

NCV_{BFG} = Net Calorific Value for BFG [kcal/ Nm^3].

Details of baseline emissions calculations are included in section D and annex 2 of the present PDD.

B.1.5.7 Project Emissions

Project emissions include CO_2 emissions from the combustion of natural gas in all element processes *i* in the project scenario. Project emissions are calculated based on the quantity of natural gas combusted in all element process *i* on the net calorific value and on CO_2 emission factor for natural gas. No emissions are associated to the combustion of BFG and COG, since emission factor for gases otherwise flared to the atmosphere can be considered equal to zero.

Emission Factor (EF) of 1.9 Kg per m^3 of natural gas in determining the amount of emission reductions for fuel combustion was used. This value is calculated starting from the IPCC value of 0.0561 tCO_2/GJ and considering the Net Calorific Value (NCF) for natural gas provided by the plant, equal to 8,106 kcal/Nm^3.

$$PE_{SP5,y} = NG_{SP5,PS,y} \cdot NCV_{NG} \cdot EF_{NG,y} \quad \text{(a.19)}$$

$$NG_{SP5,PS,y} = \sum_i NG_{SP5,PS,y,i} \quad \text{(a.20)}$$

Where:

$PE_{SP5,Y}$ = Project emissions in year y for implementation of Sub-Project #5 [tCO_2];

$NG_{SP5,PS,y}$ = Natural Gas consumption in the plant sections object of the Sub-Project #5 [Nm^3/y];

$NG_{SP5,PS,y,i}$ = Natural Gas consumption in the element process i in the year y [Nm^3/y];

NCV_{NG} = Net Calorific Value for NG [kcal/ Nm^3].

$EF_{NG,y}$ = Emission Factor for NG combustion in year y [tCO_2/GJ];

Details of project emissions calculations are included in section D and annex 2 of the present PDD.

B.1.5.8 Leakage

Proposed sub-project activity leads to reduction in natural gas consumption. For this reason, the only leakages that could be detected due to the implementation of the proposed project activities is possible reduction in leakages from extraction, processing, liquefaction, transportation and distribution of natural gas.

Since, in order to be conservative, these leakages have not been considered in the calculations, this section is not applicable.

B.1.5.9 Emission Reductions

Emission reductions due to this sub-project activity during the year y are calculated as the difference between the baseline and the project emissions. The formulae can be reported as follow:

$$ER_{SP5,y} = BE_{SP5,y} - PE_{SP5,y} \quad \text{(a.21)}$$

Where:

$ER_{SP5,Y}$ = Emission reduction in year y for implementation of Sub-Project #5 [tCO_2];

$BE_{SP5,Y}$ = Baseline emissions in year y [tCO_2];

$PE_{SP5,Y}$ = Project emissions in year y for implementation of Sub-Project #5 [tCO_2];

B.1.6 SP6 - Turbo Generators Installation

B.1.6.1 Source

In spite of the fact that there are not approved methodologies fully applicable to set baseline and demonstrate additionality of the present sub-project, the baseline setting described hereinafter make reference to the approved consolidated methodology ACM0012 - version 03"Consolidated baseline methodology for GHG emission reduction for waste gas or waste heat or waste pressure for power generation".

This baseline setting also refers to the latest approved versions of the following tools:

- Guidelines for completing the proposed new baseline and monitoring methodologies – version 06.2;
- Combined tool to identify the baseline scenario and demonstrate additionality – version 02.1;
- Tool for the demonstration and assessment of additionality – version 04;
- "Standardized emission factor for the Ukrainian electricity grid", version 5 dated 2 February 2007. This document is reported in annex 2 for consultation.

B.1.6.2 Selected approach

The selected approach from paragraph 48 of the CDM modalities and procedures is "existing actual or historical emissions, as applicable".

B.1.6.3 Applicability conditions

This baseline setting for this sub-project can refer to the Approved methodology mentioned above since utilize was gas/waste heat as energy source for generation of electricity.

The methodology is applicable under the following conditions:

- Electricity is generated by the owner of the industrial facility producing the waste gas/heat;
- Regulations do no constrain the industrial facility using waste gas from using the same fuel being used prior to the implementation of this sub-project;
- The methodology covers both new and existing facilities;
- The waste gas utilized in the project activity would be flared or released into the atmosphere in absence of the project activity;
- The credits will be claimed by the generator of energy using waste gas;
- The credits can be claimed for minimum of the following time periods: i) the remaining lifetime of equipment currently being used; ii) credit period.
- Waste gas that is released under abnormal operation (emergencies shut down) of the plant will not be accounted for.

B.1.7.4 Sub-project boundaries

The geographical extent project boundaries include the following:

1) the sections of the plant where waste gas is generated (Blast Furnaces and Coke oven Batteries);
2) the boundaries of sub-project #5;
3) the sections of the plant where process heat is generated (HPP1 and HPP3);
4) the facilities where the steam is used to produce electricity (the two existing 60 MW turbines at HPP3 and the two new 25 MW TG).
5) Existent turbines and generators in HPP1 and HPP3;
6) the National electricity grid where indirect emission reduction will take place.

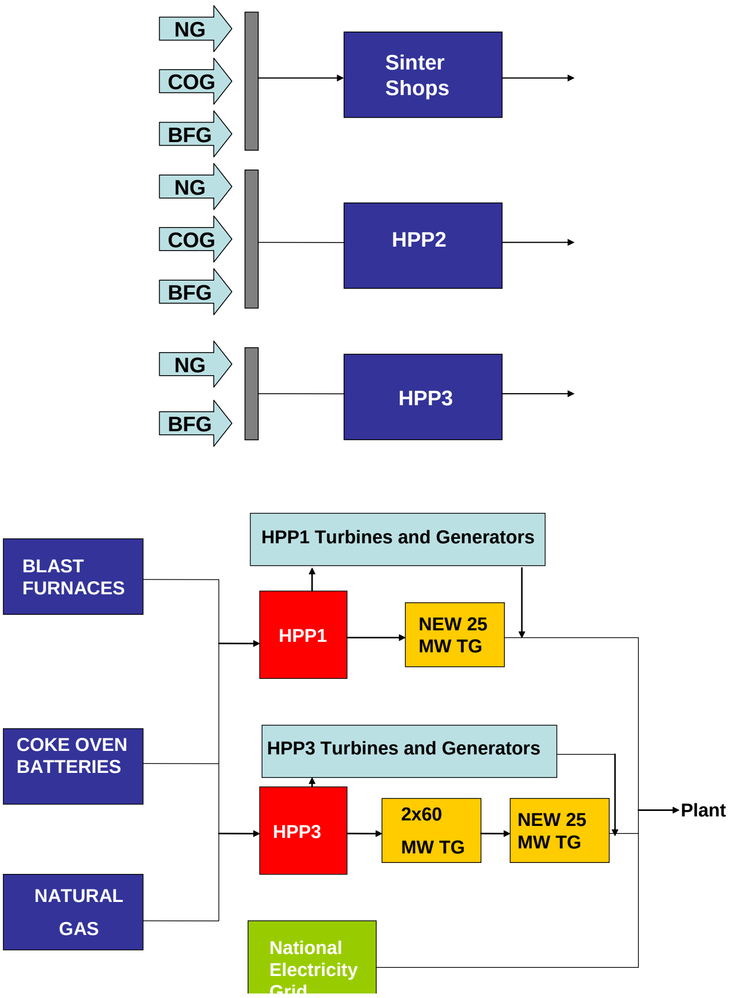


Figure 14: Sub-Project #6 boundaries

Overview of emission sources included in or excluded from the project boundary is provided in the following table:

	Source	Gas	Included?	Justification/ explanation
Baseline	Electricity generation from the grid	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification: conservative assumption
		N_2O	Excluded	Excluded for simplification: conservative assumption
	Natural Gas consumption	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification: conservative assumption
		N_2O	Excluded	Excluded for simplification: conservative assumption
Project Activity	Electricity generation from the grid	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	Natural Gas consumption	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification

B.1.6.5 Identification of the baseline scenario and demonstration of additionality

The next two steps foresee the identification of the baseline scenario and the demonstration of additionality.

The “tool for demonstration and assessment of additionality”, the “Combined tool to identify the baseline scenario and demonstrate additionality” and, where possible, the ACM0012, have been used to identify the main principles underlying the baseline setting, additionality, and monitoring. While identifying the baseline and project emissions, the general principles of Annex B of 16/CP.7 (in particular: (i) project-specific approach, (ii) taking conservative assumption, and (iii) taking into account relevant policies) have been adhered too.

Applicability

The “Combined tool to identify the baseline scenario and demonstrate additionality – Version 2.1” provides for a step-wise approach to identify the baseline scenario and simultaneously demonstrate additionality.

This Project envisages that:

- Energy improvements at existing installations are operated by project participants;
- Fuel switch at existing installations are operated by project participants;

Since all the potential alternative scenarios identified in the following paragraphs, are under control of the project participants, and this tool can be applied also for new facilities, the present methodology is fully applicable to the proposed Sub-Project.

Approach to select the baseline scenario and assess additionality

Please refer to paragraph §B.1.1.5.

STEP 1. Identification of alternative scenarios

Step 1a. Define alternative scenarios to the proposed JI project activity.

The baseline alternatives to be considered can be summarized as follow:

a) Continuation of the existing situation

This scenario foresees the continuation of activities under a business-as-usual scenario. In absence of the project activity, AMKR could continue with the existent practice of process steam and electricity generation. The electricity demand would be covered both by the current internal electricity production and by buying it from the National electricity grid. The waste gas generated by the process would continue not be used.

b) Implementation of the proposed Project activity without being registered as a JI

This scenario foresees the establishment of the new 25 MW turbines even in absence of the JI incentives.

c) Use of alternative technologies rather than those proposed by the Project participant

This scenario foresees the production of the same amount of electricity foreseen in this sub-project, with alternative technologies/fuel compared with those proposed by the project participants.

Step 1b. Consistency with mandatory applicable laws and regulations

All the alternatives defined in the Step 1 above are in compliance with all mandatory applicable legal and regulatory requirements.

The following step foresees the project developer to choose between the Barrier and the investment analysis. Even if it is not necessary both the two paths have been developed in order to better provide evidence of the baseline and additionality of this project.

STEP 2. Barrier analysis

Sub-step 2a. Identify barriers that would prevent the implementation of alternatives scenarios:

Barriers that would prevent the implementation of alternative scenarios are the same as described at paragraph §B.1.1.5, Sub-step 2a and, for this reason, they are not repeated here.

Sub-step 2b. Eliminate alternative scenarios which are prevented by the identified barriers

The alternative c) "Use of alternative technologies rather than those proposed by the project participant" faces a specific technological barrier. ArcelorMittal has significant experience in restructuring large-scale operations. The Company will be able to draw on the collective experience and expertise of ArcelorMittal.

Nonetheless, the use of different technologies rather than those proposed by the project participants could lead to an unacceptable risk of equipment disrepair, malfunctioning or other underperformances due to the lack of skills and experience in the relevant geographic area. Moreover, there is no logical solution for installing renewable or any other alternative type of electricity production systems instead of those proposed by AMKR.

Thus, there are not acceptable reasons for implementing different technologies than those proposed by the Company. Moreover, the measures proposed for the project shall lead to consistent improvement in the energy efficiency of the operations.

Therefore, this alternative has been excluded from further considerations.

The two remaining scenarios that can be viewed as alternative scenarios are: the continuation of the existing situation or the proposed intervention without the JI incentive.

The alternative a) "continuation of existing situation" does not require any investment by the Company and therefore is not affected by the barriers listed above.

Moreover, there are not technical, sectoral, legislative, economical, and environmental key factors that oblige to carry out any change in the business-as-usual-operations, as:

- There is no need to increase electricity production at the plant to cover the internal electricity demand. Additional electricity expected to be produced by the proposed sub-project would be covered by purchasing electricity from the national grid.
- steel industry sector of Ukraine was created during the Soviet era, when energy efficiency was not a priority for facilities. ArcelorMittal's competitors playing on the Ukrainian steel market continue to use the aged equipment without rehabilitation programmes;
- the facility complies with the current regulations and no relevant development in legislation within the Host Country is foreseen in the next years;
- the Company is one of the lowest cost steel producers in the world. It has established markets in emerging regions which have a particularly high growth in steel demand;
- no environmental issues are associated with the continuation of the current operations.

The alternative b) "Implementation of all the proposed intervention without the JI incentive" faces both prevailing practice and financial barriers.

Reasons why "Implementation of the proposed intervention without the JI incentive" faces prevailing practice and financial barriers are the same as described at §B.1.1.5, and are not repeated here.

Based on all the considerations reported at §B.1.1.5, the only alternative scenario to the project activity not prevented by any barrier is:

a) Continuation of the existing situation

The "Combined tool to identify the baseline scenario and demonstrate additionality" reports that: "*if there is only one alternative scenario that it is not prevented by any barrier, and this alternative is **not** the proposed project undertaken without being registered as a JI project activity, then this alternative scenario is identified as baseline scenario and the "step 3" can be avoided*".

Based on this assumption "Continuation of existing situation" represents the baseline scenario for the proposed JI project.

STEP 3. Investment analysis

Even if "Continuation of existing situation" is the only alternative remaining scenario, and therefore can be considered as the baseline for this sub-project, in order to provide with more evidence about the additionality of the project, here below an investment analysis is provided. This specific sub-section takes reference to the "tool for the demonstration and assessment of additionality".

Sub-step 3a.Determination of appropriate analysis method

For the determination of the appropriate analysis method please refer to §B.1.1.5., sub-step3a.

Sub-step 3b.Calculation and comparison of financial indicators

The main drivers of the financial analysis for the proposed sub-project activity are all relevant costs for implementation of the project, and the revenues (excluding Carbon Credit revenues) coming from the energy savings associated with the project implementation.

Since ArcelorMittal is the only project developer, the calculated financial parameters have been compared with the corporate internal benchmark (Weighted average capital cost of the company, WACC). In performing such analysis it has to be taken into account that ArcelorMittal has never implemented energy efficiency investments in Ukraine prior to this project activity.

The WACC usually taken as reference by the company is 15%. However, the "tool for the demonstration and assessment of additionality" reports that the project risk have to be included through the cash flow pattern. In order to cover the risk factor associated to invest in such kind on countries the Corporate WACC was reasonably set around 20%, lower than the average discount rates provided by banks providing funds for energy investments in Ukraine usually higher than 21-23%.

The economic indicators for the proposed sub-project without JI revenues have been calculated utilizing financial criteria developed during the PDD preparation, and by running a preliminary CAPEX program that is provided as annex to the present document.

In implementing the model, the following assumptions have been considered:

- Electricity and natural gas prices are the most updated values available (end of 2007);
- The estimation of investment conservatively take into account only main equipments and intervention. Additional costs are expected during the implementation but have not been considered here (conservative assumption);
- O&M costs are rough estimations based on energy managers' experience and take into account only major expected expenses (conservative assumption);
- Price of carbon credits has been fixed at 24.5€/ERU.

The main economic inputs for the present sub-project can be summarized as follow:

INPUT DATA		
Investment	34,889	kEur
Additional O&M costs	1,016	kEur
Annual saving	10,552	kEur
Life time	15	Yrs
Corporation Tax	25	%
Discount Rate / WACC	20	%

Table 25: Financial inputs for Sub-Project 6

The main results of the financial analysis can be summarized as follow:

RESULTS	Without JI		With JI	
IRR	18.1	%	23.8	%
NPV	-2,943	kEur	5,421	kEur
Payback time	5.1	Yrs	4.0	Yrs

Table 26: Financial indicators for Sub-Project 6

The financial results show that the expected project profit is not sufficient to cover the corporate benchmark required for this project without carbon credit revenues. JI registration would permit to cover all additional risk factor associated with project implementation in Ukraine.

Sub-step 3c. Sensitivity Analysis

A sensitivity analysis of the proposed sub-project was made in order to check the robustness of the financial results. Parameters that more likely could change in the future are the price of electricity, the expected electricity savings, the total investment costs and the price of carbon credits.

Sensitivity Analysis	IRR Without JI		IRR With JI	
Electricity savings up by10%	20.2	%	26.0	%
Electricity Price up by 10%	20.2	%	26.0	%
Investment 10% down	20.2	%	26.7	%
Carbon Credit price 10% down	18.1	%	23.2	%

Table 27: Sensitivity Analysis for Sub-Project 6

The results show that the sub-project scenario is not significantly affected by any of the parameters object of the present sensitivity analysis.

Since the project-activity has a less favourable indicator (lower IRR) than the benchmark, the financial analysis explained above, confirms the results of the barrier analysis that "Continuation of existing situation" represents the baseline scenario for the proposed sub-project.

Impact of JI registration

Revenues coming from selling of carbon credits could permit to reach the Company benchmark and to cover all the risks associated with the implementation of the project in Ukraine. This result is confirmed even if no change occurs in the input parameters as analyzed in the sensitivity analysis.

STEP 4. Common practice analysis

Considerations on how this sub-project have not to be considered common practice are the same as those included at §B.1.1.5-STEP 4, and are not repeated here.

To conclude, based on the "Combined tool to identify the baseline scenario and demonstrate additionality" the proposed Sub-Project is not to be considered common practice and it is additional to what would otherwise occur.

B.1.6.6 Baseline Emissions

The baseline emissions are defined as emission that would have occurred in absence of the project activity to meet the equivalent power output obtained in the project scenario from the project boundary.

The electricity emission factor used is the emission coefficient of the Ukrainian electricity grid expressed in t CO_2/MWh. This coefficient for the Ukrainian Electricity Grid refers to the document "Standardized emission factor for the Ukrainian electricity grid", version 5 dated 2 February 2007. The complete document is included in Annex 2 for consultation.

The IPCC guidelines emission factor has been used for emissions associated to natural gas combustion.

The Baseline emissions for the year y are determined as follow:

$$BE_{SP6,y} = NG_{SP6,BS,y} \cdot NCV_{NG} \cdot EF_{NG,y} + EC_{SP6,BS,y} \cdot EF_{el,y} \quad \text{(a.22)}$$

Where:

$BE_{SP6,Y}$ = Baseline emissions in year y [tCO_2];

$NG_{SP6,BS,,y}$ = Natural gas consumption for generation of steam in the baseline scenario [Nm^3/y];

NCV_{NG} = Net Calorific Value for NG [kcal/ Nm^3].

$EF_{NG,y}$ = Emission Factor for NG combustion in year y [tCO_2/GJ];

$EC_{SP6,BS,y}$ = Electricity produced by the project activity during the year y less the electricity that would have been produced by the HPPS object of this measure without the implementation of the project (ex ante value) [MWh/y];

$EF_{el,y}$ = Carbon Emission Factor for Ukrainian electricity grid in year y [tCO_2/MWh].

Details of baseline emissions calculations are included in section D and annex 2 of the present PDD.

B.1.6.7 Project Emissions

Additional waste gas that will be combusted in the project scenario would have been flared into the atmosphere. Therefore, the emissions associated to the combustion of these gases will be considered equal to zero. However, project emissions include the emission due to possible natural gas combustion needed to provide the additional power output (in comparison with the baseline scenario). The emission coefficient used for natural gas combustion is the IPCC guidelines emission factor.

$$PE_{SP6,y} = NG_{SP6,PS,y} \cdot NCV_{NG} \cdot EF_{NG,y} \quad \text{(a.23)}$$

Where:

$PE_{SP6,Y}$ = Project emissions in year y for implementation of Sub-Project #6 [tCO_2];

$NG_{SP6,PS,y}$ = Natural Gas consumption in the plant sections object of the Sub-Project #6 [Nm^3/y];

NCV_{NG} = Net Calorific Value for NG [kcal/ Nm^3].

$EF_{NG,y}$ = Emission Factor for NG combustion in year y [tCO_2/GJ];

Details of project emissions calculations are included in section D and annex 2 of the present PDD.

B.1.6.8 Leakage

Proposed sub-project activity leads to reduction in electricity consumption. For this reason, the only leakages that could be detected due to the implementation of the proposed project activities would lead to possible reduction in leakages from electricity transportation.

Since, in order to be conservative, these leakages have not been considered in the calculations, this section is not applicable.

B.1.6.9 Emission Reductions

Emission reductions due to this sub-project activity during the year y are calculated as the difference between the baseline and the project emissions. The formulae can be reported as follow:

$$ER_{SP6,y} = BE_{SP6,y} - PE_{SP6,y} \qquad (a.24)$$

Where:

$ER_{SP6,Y}$ = Emission reduction in year y for implementation of Sub-Project #6 [tCO_2];

$BE_{SP6,Y}$ = Baseline emissions in year y [tCO_2];

$PE_{SP6,Y}$ = Project emissions in year y for implementation of Sub-Project #6 [tCO_2];

B.1.7 SP7 - BF top recovery turbine installation

B.1.7.1 Source

In spite of the fact that there are not approved methodologies fully applicable to set baseline and demonstrate additionality of the present sub-project, the baseline setting described hereinafter make reference to the approved consolidated methodology ACM0012 “Consolidated baseline methodology for GHG emission reduction for waste gas or waste heat or waste pressure for power generation – Version 03”.

This baseline setting also refers to the latest approved versions of the following tools:

- Guidelines for completing the proposed new baseline and monitoring methodologies – version 06.2;
- Combined tool to identify the baseline scenario and demonstrate additionality – version 02.1;
- Tool for the demonstration and assessment of additionality – version 04;
- “Standardized emission factor for the Ukrainian electricity grid”, version 5 dated 2 February 2007. This document is reported in annex 2 for consultation.

B.1.7.2 Selected approach

The selected approach from paragraph 48 of the CDM modalities and procedures is “existing actual or historical emissions, as applicable”

B.1.7.3 Applicability conditions

This baseline setting for this sub-project can refer to the Approved methodology mentioned above since utilize waste pressure as a energy source for generation of electricity.

The methodology is applicable under the following conditions:

- Electricity generated using waste gas pressure will be measurable;
- Electricity is generated by the owner of the industrial facility producing the waste gas;
- Regulations do no constrain the industrial facility using waste gas from using the same fuel being used prior to the implementation of this sub-project;
- The methodology covers both new and existing facilities;
- The gas pressure utilized in the project activity would be flared or released into the atmosphere in absence of the project activity;
- The credits will be claimed by the generator of energy using waste gas/pressure;
- The credits can be claimed for minimum of the following time periods: i) the remaining lifetime of equipment currently being used; ii) credit period.

B.1.7.4 Sub-project boundaries

The geographical extent project boundaries include the following:

1) the sections of the plant where waste gas is generated (Blast Furnaces n.9);
2) the facility where the waste gas pressure is used to produce electricity (the new top recovery turbine).
3) the National electricity grid where indirect emission reduction will take place.

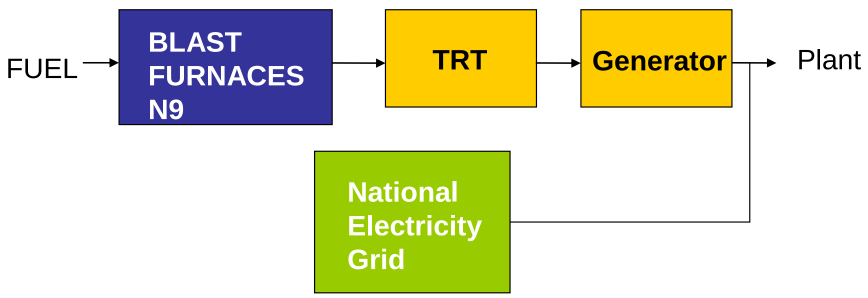


Figure 15: Sub-Project #7 boundaries

Overview of emission sources included in or excluded from the project boundary is provided in the following table:

	Source	Gas	Included?	Justification/ explanation
Baseline	Electricity generation from the grid	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification: conservative assumption
		N_2O	Excluded	Excluded for simplification: conservative assumption
Project	Electricity generation from the grid	CO_2	Excluded	This is a zero emission project activity
		CH_4	Excluded	This is a zero emission project activity

		N_2O	Excluded	This is a zero emission project activity

B.1.7.5 Identification of the baseline scenario and demonstration of additionality

The next two steps foresee the identification of the baseline scenario and the demonstration of additionality.

The "tool for demonstration and assessment of additionality", the "Combined tool to identify the baseline scenario and demonstrate additionality", and, where possible, the ACM0012, have been used to identify the main principles underlying the baseline setting, additionality, and monitoring. While identifying the baseline and project emissions, the general principles of Annex B of 16/CP.7 (in particular: (i) project-specific approach, (ii) taking conservative assumption, and (iii) taking into account relevant policies) have been adhered too.

Applicability

The "Combined tool to identify the baseline scenario and demonstrate additionality – Version 2.1" provides for a step-wise approach to identify the baseline scenario and simultaneously demonstrate additionality.

This Project envisages that:

- energy improvements at existing installations are operated by project participants;

Since all the potential alternative scenarios identified in the following paragraphs, are under control of the project participants, and this tool can be applied also for new facilities, the present methodology is fully applicable to the proposed Sub-Project.

Approach to select the baseline scenario and assess additionality

Please refer to paragraph §B.1.1.5.

STEP 1. Identification of alternative scenarios

Step 1a. Define alternative scenarios to the proposed JI project activity.

The baseline alternatives to be considered can be summarized as follow:

a) Continuation of the existing situation

This scenario foresees the continuation of activities under a business-as-usual scenario. In absence of the project activity, AMKR could continue with the existent practice of electricity generation.

The electricity demand would be covered both by the current internal electricity production and by buying the remaining from the National electricity grid. The waste gas pressure generated by the process due to the increase of hot metal tapped by BF-9 would not be used.

b) Implementation of the proposed Project activity without being registered as a JI

This scenario foresees the establishment of the new Top Recovery Turbine even in absence of the JI incentives.

c) Use of alternative technologies rather than those proposed by the Project participant

This scenario foresees the production of the same amount of electricity foreseen in this sub-project, with alternative technologies/fuel compared with those proposed by the project participants.

Step 1b. Consistency with mandatory applicable laws and regulations

All the alternatives defined in the Step 1 above are in compliance with all mandatory applicable legal and regulatory requirements.

The following step foresees the project developer to choose between the Barrier and the investment analysis. Even if it is not necessary both the two paths have been developed in order to better provide evidence of the baseline and additionality of this project.

STEP 2. Barrier analysis

Sub-step 2a. Identify barriers that would prevent the implementation of alternatives scenarios:

Barriers that would prevent the implementation of alternative scenarios are the same as described at paragraph §B.1.1.5, Sub-step 2a and, for this reason, they are not repeated here.

Sub-step 2b. Eliminate alternative scenarios which are prevented by the identified barriers

The alternative c) "Use of alternative technologies rather than those proposed by the project participant" faces a specific technological barrier. ArcelorMittal has significant experience in restructuring large-scale operations. The Company will be able to draw on the collective experience and expertise of ArcelorMittal.

Nonetheless, the use of different technologies rather than those proposed by the project participants could lead to an unacceptable risk of equipment disrepair, malfunctioning or other underperformances due to the lack of skills and experience in the relevant geographic area. Moreover, since the sub-project uses the waste gas pressure, there is no technical alternative than the use of a top recovery turbine to produce electricity. Finally, there is no logical solution for installing renewable or any other alternative type of electricity production systems instead of those proposed by AMKR.

Thus, there are not acceptable reasons for implementing different technologies than those proposed by the Company.

Therefore, this alternative has been excluded from further considerations.

The two remaining scenarios that can be viewed as alternative scenarios are: the continuation of the existing situation or the proposed intervention without the JI incentive.

The alternative a) "continuation of existing situation" does not require any investment by the Company and therefore is not affected by the barriers listed above.

Moreover, there are not technical, sectoral, legislative, economical, and environmental key factors that oblige to carry out any change in the business-as-usual-operations, as:

- There is no need to increase electricity production at the plant to cover the internal electricity demand. Additional electricity expected to be produced by the proposed sub-project would be covered by purchasing electricity from the national grid;

- Steel industry sector of Ukraine was created during the Soviet era, when energy efficiency was not a priority for facilities. ArcelorMittal's competitors playing on the Ukrainian steel market continue to use the aged equipment without rehabilitation programmes;
- the facility complies with the current regulations and no relevant development in legislation within the Host Country is foreseen in the next years;
- the Company is one of the lowest cost steel producers in the world. It has established markets in emerging regions which have a particularly high growth in steel demand;
- no environmental issues are associated with the continuation of the current operations.

The alternative b) "Implementation of all the proposed intervention without the JI incentive" faces both prevailing practice and financial barriers.

Reasons why "Implementation of the proposed intervention without the JI incentive" faces prevailing practice and financial barriers are the same as described at §B.1.1.5, and are not repeated here.

Based on all the considerations reported at §B.1.1.5, the only alternative scenario to the project activity not prevented by any barrier is:

a) Continuation of the existing situation

The "Combined tool to identify the baseline scenario and demonstrate additionality" reports that: "*if there is only one alternative scenario that it is not prevented by any barrier, and this alternative is **not** the proposed project undertaken without being registered as a JI project activity, then this alternative scenario is identified as baseline scenario and the "step 3" can be avoided*".

Based on this assumption "Continuation of existing situation" represents the baseline scenario for the proposed JI project.

STEP 3. Investment analysis

Even if "Continuation of existing situation" is the only alternative remaining scenario, and therefore can be considered as the baseline for this sub-project, in order to provide with more evidence about the additionality of the project, here below an investment analysis is provided. This specific sub-section takes reference to the "tool for the demonstration and assessment of additionality".

Sub-step 3a.Determination of appropriate analysis method

For the determination of the appropriate analysis method please refer to §B.1.1.5., sub-step3a.

Sub-step 3b.Calculation and comparison of financial indicators

The main drivers of the financial analysis for the proposed sub-project activity are all relevant costs for implementation of the project, and the revenues (excluding Carbon Credit revenues) coming from the energy savings associated with the project implementation.

Since ArcelorMittal is the only project developer, the calculated financial parameters have been compared with the corporate internal benchmark (Weighted average capital cost of the company, WACC). In performing such analysis it has to be taken into account that ArcelorMittal has never implemented energy efficiency investments in Ukraine prior to this project activity.

The WACC usually taken as reference by the company is 15%. However, the "tool for the demonstration and assessment of additionality" reports that the project risk have to be included through the cash flow pattern. In order to cover the risk factor associated to invest in such kind on countries the Corporate WACC was reasonably set around 20%, lower than the average discount rates provided by banks providing funds for energy investments in Ukraine usually higher than 21-23%.

The economic indicators for the proposed sub-project without JI revenues have been calculated utilizing financial criteria developed during the PDD preparation, and by running a preliminary CAPEX program that is provided as annex to the present document.

In implementing the model, the following assumptions have been considered:

- Electricity and natural gas prices are the most updated values available (end of 2007);
- The estimation of investment conservatively take into account only main equipments and intervention. Additional costs are expected during the implementation but have not been considered here (conservative assumption);
- O&M costs are rough estimations based on energy managers' experience and take into account only major expected expenses (conservative assumption);
- Price of carbon credits has been fixed at 24.5€/ERU.

The main economic inputs for the present sub-project can be summarized as follow:

INPUT DATA		
Investment	13,333	kEur
Additional O&M costs	254	kEur
Annual saving	3,139	kEur
Life time	15	Yrs
Corporation Tax	25	%
Discount Rate / WACC	20	%

Table 28: Financial inputs for Sub-Project 7

The main results of the financial analysis can be summarized as follow:

RESULTS	Without JI		With JI	
IRR	16.0	%	20.5	%
NPV	-2,178	kEur	237	kEur
Payback time	5.6	Yrs	4.6	Yrs

Table 29: Financial indicators for Sub-Project 7

The financial results show that the expected project profit is not sufficient to cover the corporate benchmark required for this project. Carbon credit revenues would permit to cover all additional risk factor associated with project implementation in Ukraine.

Sub-step 3c. Sensitivity Analysis

A sensitivity analysis of the proposed sub-project was made in order to check the robustness of the financial results. Parameters that more likely could change in the future are: the price of electricity, the expected electricity savings, the total investment costs and the price of carbon credits.

Sensitivity Analysis	IRR Without JI		IRR With JI	
Electricity savings up by10%	18.0	%	22.7	%
Electricity Price up by 10%	18.0	%	22.7	%
Investment 10% down	18.1	%	23.4	%
Carbon Credit price 10% down	16.0	%	20.0	%

Table 30: Sensitivity Analysis for Sub-Project 7

The results show that the sub-project scenario is not significantly affected by any of the parameters object of the present sensitivity analysis.

Since the project-activity has a less favourable indicator (lower IRR) than the benchmark, this sensitivity analysis together with the financial analysis explained above, confirms the results of the barrier analysis that “Continuation of existing situation” represents the baseline scenario for the proposed sub-project.

Impact of JI registration

Revenues coming from selling of carbon credits could permit to satisfy the Company benchmark and to cover all the additional risks associated with the implementation of the project in Ukraine.

STEP 4. Common practice analysis

Considerations on how this sub-project have not to be considered common practice are the same as those included at §B.1.1.5-STEP 4, and are not repeated here.

To conclude, based on the “Combined tool to identify the baseline scenario and demonstrate additionality” the proposed Sub-Project is not to be considered common practice and it is additional to what would otherwise occur.

B.1.7.6 Baseline Emissions

The baseline emissions are defined as emissions that would have occurred in absence of the project activity to meet the equivalent power output obtained in the project scenario from the project boundary.

The electricity emission factor used is the emission coefficient of the Ukrainian electricity grid expressed in t CO_2/MWh. This coefficient for the Ukrainian Electricity Grid refers to the document “Standardized emission factor for the Ukrainian electricity grid”, version 5 dated 2 February 2007. The complete document is included in Annex 2 for consultation.

The Baseline emissions for the year y are determined as follow:

$$BE_{SP7,y} = EC_{SP7,BS,y} \cdot EF_{el,y} \qquad \text{(a.25)}$$

Where:

$BE_{SP7,Y}$ = Baseline emissions in year y for implementation of Sub-Project #7 [tCO_2];

$EC_{SP7,BS,y}$ = additional electricity consumption from the grid if compared with the project scenario, in year y after implementation of Sub-Project #7 [kWh/y];

$EF_{el,y}$ = Carbon Emission Factor for Ukrainian grid in year y [tCO_2/MWh].

Details of baseline emissions calculations are included in section D and annex 2 of the present PDD.

B.1.7.7 Project Emissions

Waste gas pressure coming from BF-9 would be released into the atmosphere in absence of the proposed sub-project. Therefore, the emissions associated to the use of these gases will be considered equal to zero.

The following formulae will be used to calculate project emissions

$$PE_{SP7,y} = EC_{SP7,PS,y} \cdot EF_{el,y} \quad \text{(a.26)}$$

Where:

$PE_{SP7,Y}$ = Project emissions in year y for implementation of Sub-Project #7 [tCO_2];

$EC_{SP7,PS,y}$ = Electricity consumption to be considered zero[kWh/y];

$EF_{el,y}$ = Carbon Emission Factor for Ukrainian grid in year y [tCO_2/MWh].

Details of project emissions calculations are included in section D and annex 2 of the present PDD.

B.1.7.8 Leakage

Proposed sub-project activity leads to reduction in electricity consumption from the national grid. For this reason, the only leakages that could be detected due to the implementation of the proposed project activities would lead to possible reduction in leakages from electricity transportation.

Since, in order to be conservative, these leakages have not been considered in the calculations, this section is not applicable.

B.1.7.9 Emission Reductions

Emission reductions due to this sub-project activity during the year y are calculated as the difference between the baseline and the project emissions. The formulae can be reported as follow:

$$ER_{SP7,y} = BE_{SP7,y} - PE_{SP7,y} \quad \text{(a.27)}$$

Where:

$ER_{SP7,Y}$ = Emission reduction in year y for implementation of Sub-Project #7 [tCO_2];

$BE_{SP7,Y}$ = Baseline emissions in year y [tCO_2];

$PE_{SP7,Y}$ = Project emissions in year y for implementation of Sub-Project #7 [tCO_2];

B.1.8 SP8 - Heat recovery in Refractory and Lime Rotary Kilns

B.8.1 Source

In spite of the fact that there are not approved methodologies fully applicable to set baseline and demonstrate additionality of the present sub-project, the baseline setting described hereinafter make reference, where possible, to the approved consolidated methodology ACM0012 "Consolidated baseline methodology for GHG emission reduction for waste gas or waste heat or waste pressure for power generation – Version 03".

This baseline setting also refers to the latest approved versions of the following tools:

- Guidelines for completing the proposed new baseline and monitoring methodologies – version 06.2;
- Combined tool to identify the baseline scenario and demonstrate additionality – version 02.1;
- Tool for the demonstration and assessment of additionality – version 04;
- "Standardized emission factor for the Ukrainian electricity grid", version 5 dated 2 February 2007. This document is reported in annex 2 for consultation.

B.1.8.2 Selected approach

The selected approach from paragraph 48 of the CDM modalities and procedures is "existing actual or historical emissions, as applicable".

B.1.8.3 Applicability conditions

The baseline setting for this sub-project can refer to the Approved methodology mentioned above since utilizes waste heat as energy source for generation of electricity. The waste heat is that of the steam that currently is wasted at the plant.

The methodology is applicable under the following conditions:

- Electricity is generated by the owner of the industrial facility producing the waste heat;
- The methodology covers both new and existing facilities;
- The credits will be claimed by the generator of energy using waste gas/heat/pressure;
- The credits can be claimed for minimum of the following time periods: i) the remaining lifetime of equipment currently being used; ii) credit period.

B.1.8.4 Sub-project boundaries

The geographical extent project boundaries include the following:

1) the sections of the plant where steam is generated (rotary kilns and recovery boilers installed behind the rotary kilns of refractory and Lime preparation shops.);
2) the facilities where the steam is used to produce electricity (the new 6 MW TG);
3) the facilities where the steam is currently used;

4) the National electricity grid where indirect emission reduction will take place;

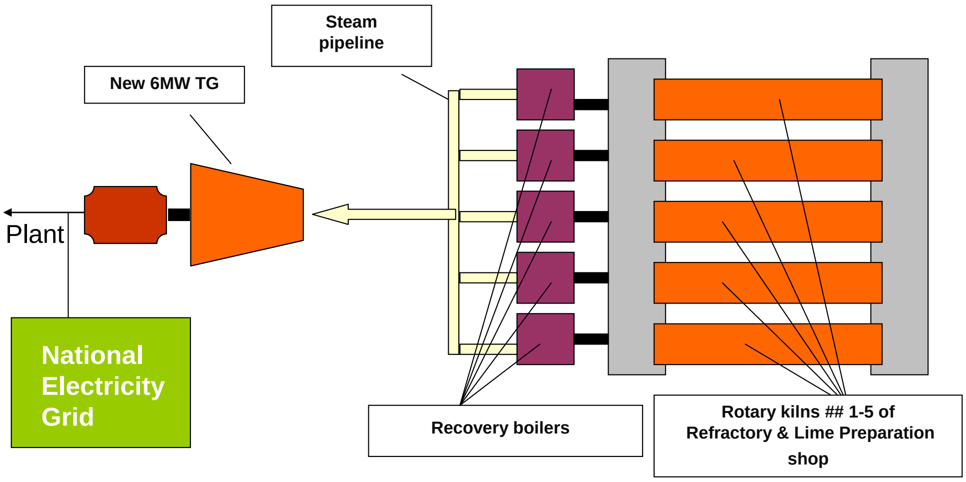


Figure 16: Sub-Project #8 boundaries

Overview of emission sources included in or excluded from the project boundary is provided in the following table:

	Source	Gas	Included?	Justification/ explanation
Baseline	Electricity generation from the grid	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification: conservative assumption
		N_2O	Excluded	Excluded for simplification: conservative assumption
	Natural Gas consumption	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification: conservative assumption
		N_2O	Excluded	Excluded for simplification: conservative assumption
Project Activity	Electricity generation from the grid	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	Natural Gas consumption	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification

B.1.8.5 Identification of the baseline scenario and demonstration of additionality

The next two steps foresee the identification of the baseline scenario and the demonstration of additionality.

The "tool for demonstration and assessment of additionality", the "Combined tool to identify the baseline scenario and demonstrate additionality", and, where possible, the ACM0012, have been used to identify the main principles underlying the baseline setting, additionality, and monitoring. While identifying the baseline and project emissions, the general principles of Annex B of 16/CP.7 (in particular: (i) project-specific approach, (ii) taking conservative assumption, and (iii) taking into account relevant policies) have been adhered too.

Applicability

The "Combined tool to identify the baseline scenario and demonstrate additionality – Version 2.1" provides for a step-wise approach to identify the baseline scenario and simultaneously demonstrate additionality.

This Project envisages that:

- energy improvements at existing installations are operated by project participants;

Since all the potential alternative scenarios identified in the following paragraphs, are under control of the project participants, and this tool can be applied also for new facilities, the present methodology is fully applicable to the proposed Sub-Project.

Approach to select the baseline scenario and assess additionality

Please refer to paragraph §B.1.1.5.

STEP 1. Identification of alternative scenarios

Step 1a. Define alternative scenarios to the proposed JI project activity.

The baseline alternatives to be considered can be summarized as follow:

a) Continuation of the existing situation

This scenario foresees the continuation of activities under a business-as-usual scenario. In absence of the project activity, AMKR could continue with the existent practice of process steam and electricity generation. The electricity demand would be covered both by the current internal electricity production and by buying it from the National electricity grid.

b) Implementation of the proposed Project activity without being registered as a JI

This scenario foresees the establishment of the new 6 MW turbine even in absence of the JI incentives.

c) Use of alternative technologies rather than those proposed by the Project participant

This scenario foresees the production of the same amount of electricity foreseen in this sub-project, with alternative technologies/fuel compared with those proposed by the project participants.

This scenario foresees also any alternative use of the waste steam.

Step 1b. Consistency with mandatory applicable laws and regulations

All the alternatives defined in the Step 1 above are in compliance with all mandatory applicable legal and regulatory requirements.

The following step foresees the project developer to choose between the Barrier and the investment analysis. Even if it is not necessary both the two paths have been developed in order to better provide evidence of the baseline and additionality of this project.

STEP 2. Barrier analysis

This step serves to identify barriers and to assess which alternatives these barriers prevent.

Sub-step 2a. Identify barriers that would prevent the implementation of alternatives scenarios:

Barriers that would prevent the implementation of alternative scenarios are the same as described at paragraph §B.1.1.5, Sub-step 2a and, for this reason, they are not repeated here.

Sub-step 2b. Eliminate alternative scenarios which are prevented by the identified barriers

The alternative c) "Use of alternative technologies rather than those proposed by the project participant" faces a specific technological barrier. ArcelorMittal has significant experience in restructuring large-scale operations. The Company will be able to draw on the collective experience and expertise of ArcelorMittal.

Nonetheless, the use of different technologies rather than those proposed by the project participants could lead to an unacceptable risk of equipment disrepair, malfunctioning or other underperformances due to the lack of skills and experience in the relevant geographic area. Moreover, there is no logical solution for installing renewable or any other alternative type of electricity production systems instead of those proposed by AMKR.

To conclude the analysis of this sub-project, the project developer tried to check any alternative solution to use the waste steam. The result of this analysis is that there is no possibility at the plant to use the waste steam at the produced pressure and temperature because of the following:

i) the only way to use the steam is to reduce both temperature and pressure by using special devices. Such technology is already in operation at the plant, but actually does not allow to recovery the energy associated with the waste steam production.

ii) It is not possible to use this waste steam in other areas of the plant as the kilns are too far from the rest of the facilities. Transportation would be too much expensive and a lot of thermal energy would be wasted along the way.

Thus, there are not acceptable reasons for implementing different technologies than those proposed by the Company. Moreover, the measures proposed for the project shall lead to consistent improvement in the energy efficiency of the operations.

Therefore, these alternatives have been excluded from further considerations.

The two remaining scenarios that can be viewed as alternative scenarios are: the continuation of the existing situation or the proposed intervention without the JI incentive.

The alternative a) "continuation of existing situation" does not require any investment by the Company and therefore is not affected by the barriers listed above.

Moreover, there are not technical, sectoral, legislative, economical, and environmental key factors that oblige to carry out any change in the business-as-usual-operations, as:

- There is no need to increase electricity production at the plant to cover the internal electricity demand. Additional electricity expected to be produced by the proposed sub-project would be covered by purchasing electricity from the national grid.
- all equipments that will be replaced by implementing the Project activities are still workable for a long time period, including the old ones;
- the facility complies with the current regulations and no relevant development in legislation within the Host Country is foreseen in the next years;
- the Company is one of the lowest cost steel producers in the world. It has established markets in emerging regions which have a particularly high growth in steel demand;
- no environmental issues are associated with the continuation of the current operations.

The alternative b) "Implementation of all the proposed intervention without the JI incentive" faces both prevailing practice and financial barriers.

Reasons why "Implementation of the proposed intervention without the JI incentive" faces prevailing practice and financial barriers are the same as described at §B.1.1.5, and are not repeated here.

Based on all the considerations reported at §B.1.1.5, the only alternative scenario to the project activity not prevented by any barrier is:

a) Continuation of the existing situation

The "Combined tool to identify the baseline scenario and demonstrate additionality" reports that: "*if there is only one alternative scenario that it is not prevented by any barrier, and this alternative is* ***not*** *the proposed project undertaken without being registered as a JI project activity, then this alternative scenario is identified as baseline scenario and the "step 3" can be avoided*".

Based on this assumption "Continuation of existing situation" represents the baseline scenario for the proposed JI project.

STEP 3. Investment analysis

Even if "Continuation of existing situation" is the only alternative remaining scenario, and therefore can be considered as the baseline for this sub-project, in order to provide with more evidence about the additionality of the project, here below an investment analysis is provided. This specific sub-section takes reference to the "tool for the demonstration and assessment of additionality".

Sub-step 3a.Determination of appropriate analysis method

For the determination of the appropriate analysis method please refer to §B.1.1.5., sub-step3a.

Sub-step 3b.Calculation and comparison of financial indicators

The main drivers of the financial analysis for the proposed sub-project activity are all relevant costs for implementation of the project, and the revenues (excluding Carbon Credit revenues) coming from the energy savings associated with the project implementation.

Since ArcelorMittal is the only project developer, the calculated financial parameters have been compared with the corporate internal benchmark (Weighted average capital cost of the company, WACC). In performing such analysis it has to be taken into account that ArcelorMittal has never implemented energy efficiency investments in Ukraine prior to this project activity.

The WACC usually taken as reference by the company is 15%. However, the "tool for the demonstration and assessment of additionality" reports that the project risk have to be included through the cash flow pattern. In order to cover the risk factor associated to invest in such kind on countries the Corporate WACC was reasonably set around 20%, lower than the average discount rates provided by banks providing funds for energy investments in Ukraine usually higher than 21-23%.

The economic indicators for the proposed sub-project without JI revenues have been calculated utilizing financial criteria developed during the PDD preparation, and by running a preliminary CAPEX program that is provided as annex to the present document.

In implementing the model, the following assumptions have been considered:

- Electricity prices are the most updated values available (end of 2007);
- The estimation of investment conservatively take into account only main equipments and intervention. Additional costs are expected during the implementation but have not been considered here (conservative assumption);
- O&M costs are rough estimations based on energy managers' experience and take into account only major expected expenses (conservative assumption);
- Price of carbon credits has been fixed at 24.5€/ERU.

The main economic inputs for the present sub-project can be summarized as follow:

INPUT DATA		
Investment	4,200	kEur
Additional O&M costs	229	kEur
Annual saving	1,105	kEur
Life time	15	Yrs
Corporation Tax	25%	%
Discount Rate / WACC	20%	%

Table 31: Financial inputs for Sub-Project 8

The main results of the financial analysis can be summarized as follow:

RESULTS	Without JI		With JI	
IRR	15.3	%	20.3	%
NPV	-801	kEur	49	kEur
Payback time	5.8	Yrs	4.6	Yrs

Table 32: Financial indicators for Sub-Project 8

The financial results show that the expected project profit is not sufficient to cover the corporate benchmark required for this project. Carbon credit revenues would permit to cover almost all additional risk factor associated with project implementation in Ukraine.

Sub-step 3c. Sensitivity Analysis

A sensitivity analysis of the proposed sub-project was made in order to check the robustness of the financial results. Parameters that more likely could change in the future are the price of electricity, the expected electricity savings, the total investment costs and the price of carbon credits.

Sensitivity Analysis	IRR Without JI		IRR With JI	
Electricity savings up by10%	17.6	%	22.9	%
Electricity Price up by 10%	17.6	%	22.9	%
Investment 10% down	17.3	%	23.2	%
Carbon Credit price 10% down	15.3	%	19.8	%

Table 33: Sensitivity Analysis for Sub-Project 8

The results show that the sub-project scenario is not significantly affected by any of the parameters object of the present sensitivity analysis.

Since the project-activity has a less favourable indicator (lower IRR) than the benchmark, this sensitivity analysis together with the financial analysis explained above, confirms the results of the barrier analysis that "Continuation of existing situation" represents the baseline scenario for the proposed sub-project.

Impact of JI registration

Revenues coming from selling of carbon credits could permit to reach the Company benchmark and to cover almost all the risks associated with the implementation of the project in Ukraine.

STEP 4. Common practice analysis

Considerations on how this sub-project have not to be considered common practice are the same as those included at §B.1.1.5-STEP 4, and are not repeated here.

To conclude, based on the "Combined tool to identify the baseline scenario and demonstrate additionality" the proposed Sub-Project is not to be considered common practice and it is additional to what would otherwise occur.

B.1.8.6 Baseline Emissions

The baseline emissions are defined as emission that would have occurred in absence of the project activity to meet the equivalent power output obtained in the project scenario from the project boundary.

The electricity emission factor used is the emission coefficient of the Ukrainian electricity grid expressed in t CO_2/MWh. This coefficient for the Ukrainian Electricity Grid refers to the document "Standardized emission factor for the Ukrainian electricity grid", version 5 dated 2 February 2007. The complete document is included in Annex 2 for consultation.

The emission coefficient used for natural gas combustion is the IPCC guidelines emission factor.

The Baseline emissions for the year y are determined as follow:

$$BE_{SP8,y} = NG_{SP8,BS,y} \cdot NCV_{NG} \cdot EF_{NG,y} + EC_{SP8,BS,y} \cdot EF_{el,y} \quad \text{(a.28)}$$

Where:

$BE_{SP8,Y}$ = Baseline emissions in year y [tCO_2];

$NG_{SP8,BS,,y}$ = Baseline emissions from generation of steam using natural gas [Nm^3/y];

NCV_{NG} = Net Calorific Value for NG [kcal/ Nm^3].

$EF_{NG,y}$ = Emission Factor for NG combustion in year y [tCO_2/GJ];

$EC_{SP8,BS,y}$ = baseline emission from electricity generated by the project activity during the year y [MWh/y];

$EF_{el,y}$ = Carbon Emission Factor for Ukrainian electricity grid in year y [tCO_2/MWh].

Details of baseline emissions calculations are included in section D and annex 2 of the present PDD.

B.1.8.7 Project Emissions

The steam that would run the new 6 MW turbine would be wasted without the implementation of the project. No need of additional energy is required to run this turbine so no emissions should be associated to the project scenario. Nonetheless, if natural gas is used, this will be monitored in order to include any possible emission related to the increasing of natural gas consumption if compared to the project scenario. The emission coefficient used for natural gas combustion is the IPCC guidelines emission factor.

$$PE_{SP8,y} = NG_{SP8,PS,y} \cdot NCV_{NG} \cdot EF_{NG,y} \quad \text{(a.29)}$$

Where:

$PE_{SP8,Y}$ = Project emissions in year y for implementation of Sub-Project #8 [tCO_2];

$NG_{SP8,PS,y}$ = Natural Gas consumption in the plant sections object of the Sub-Project #8 [Nm^3/y];

NCV_{NG} = Net Calorific Value for NG [kcal/ Nm^3].

$EF_{NG,y}$ = Emission Factor for NG combustion in year y [tCO_2/GJ];

Details of project emissions calculations are included in section D and annex 2 of the present PDD.

B.1.9.8 Leakage

Proposed sub-project activity leads to reduction in electricity consumption. For this reason, the only leakages that could be detected due to the implementation of the proposed project activities would lead to possible reduction in leakages from electricity transportation.

Since, in order to be conservative, these leakages have not been considered in the calculations, this section is not applicable.

B.1.8.9 Emission Reductions

Emission reductions due to this sub-project activity during the year y are calculated as the difference between the baseline and the project emissions. The formulae can be reported as follow:

$$ER_{SP8,y} = BE_{SP8,y} - PE_{SP8,y} \quad \text{(a.30)}$$

Where:

$ER_{SP8,Y}$ = Emission reduction in year y for implementation of Sub-Project #8 [tCO_2];

$BE_{SP8,Y}$ = Baseline emissions in year y [tCO_2];

$PE_{SP8,Y}$ = Project emissions in year y for implementation of Sub-Project #8 [tCO_2];

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:

Based on the requirements of the "Combined tool to identify the baseline scenario and demonstrate additionality" and on the results of the step-wide approach described at paragraph B.1 for each sub-project, the proposed JI project "Energy efficiency investment program at OJSC ArcelorMittal Steel Kryviy Rih" is additional to what would otherwise occur.

Since the project activity, if compared to the baseline scenario, will lead to reduction of energy consumptions (electricity and Natural Gas), the anthropogenic emissions of GHGs will be reduced below those that would have occurred in the absence of the JI project.

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

There are the following sources of GHG emissions related to the proposed Project:

- Emissions related to direct fuel combustion;
- Indirect GHG emissions in the Ukrainian grid as a result of electricity consumption;

Baseline Scenario

In the table below, a summary of emission sources in the baseline scenario as described at paragraph B.2 is provided. Emissions that are not influenced by the Project activity have not been included in the project boundary.

N°	Source	Gas[14]	Direct / indirect	Included / excluded	Justification / Explanation
1	Electricity generation from fuel combustion in the national electricity grid	CO_2	indirect	included	The consumption of electricity in the baseline scenario results in emission by the Ukrainian Electricity Grid production process.
2	Electricity consumption of	CO_2	indirect	included	The use of the selected

[14] Only CO_2 emissions are considered. According to approved methodology, emissions of CH_4 and N_2O have been excluded for simplification.

N°	Source	Gas[14]	Direct / indirect	Included / excluded	Justification / Explanation
	selected compressors				compressors leads to electricity consumption. This results in emission by the Ukrainian Electricity Grid.
3	Electricity consumption of selected Air Separating Units	CO_2	indirect	included	The use of the selected ASUs leads to electricity consumption. This results in emission by the Ukrainian Electricity Grid.
4	Electricity losses due to low power factor in the selected sub-stations	CO_2	indirect	included	Low power factor leads to electricity losses. This results in emission by the Ukrainian Electricity Grid.
5	Emission from NG combustion used in Rolling shop	CO_2	direct	included	NG combustion will result in emissions.
6	Emission from NG combustion used in Sinter Shop	CO_2	direct	included	NG combustion will result in emissions.
7	Emission from NG combustion used in Refractory and Lime Kilns	CO_2	direct	included	NG combustion will result in emissions.
8	Emission from NG combustion used in the boilers of the HPP plants	CO_2	direct	included	NG combustion will result in emissions.
9	All other emissions that are not attributed to the proposed project	CO_2		excluded	

Table 34: Source of emissions in the baseline scenario

Project Scenario

Table below, provide a summary of emission sources in the Project scenario, as described at § B.2. All emissions that are not influenced by the Project activity have not been included in the project boundary.

N°	Source	Gas[15]	Direct / indirect	Included / excluded	Justification / Explanation
1	Electricity generation from fuel combustion in the national electricity grid	CO_2	indirect	included	The consumption of electricity in the project scenario results in emission by the Ukrainian Electricity Grid (UEG).
2	Electricity consumption of selected compressors	CO_2	indirect	included	The use of the selected compressors leads to

[15] Only CO_2 emissions are considered. According to approved methodology, emissions of CH_4 and N_2O have been excluded for simplification (conservative assumption).

N°	Source	Gas[15]	Direct / indirect	Included / excluded	Justification / Explanation
					electricity consumption. This results in emission on the UEG.
3	Electricity consumption of selected Air Separating Units	CO_2	indirect	included	The use of the selected ASUs leads to electricity consumption. This results in emission by the UEG production process.
4	Electricity losses for reactive power in the selected sub-stations	CO_2	indirect	included	Reactive power leads to electricity losses. This results in emission by the UEG production process.
5	Emission from NG combustion used in Rolling shops	CO_2	direct	included	The mixture used in rolling shop 2 and 3 will contain COG, BFG and NG. NG combustion will result in emissions.
6	Emission from NG combustion used in Sinter Shop	CO_2	direct	included	NG combustion will result in emissions.
7	Emission from NG combustion used in Refractory and Lime Kilns	CO_2	direct	included	NG combustion will result in emissions.
8	Emission from NG combustion for steam production	CO_2	direct	included	NG combustion will result in emissions.
9	Emission from BFG and COG combustion within the project activities	CO_2	direct	included	BFG used within the project activities would otherwise release carbon. Thus, BFG emissions are considered equal to zero[16].
10	Emission from COG combustion within the project activities	CO_2	direct	included	COG used within the project activities would otherwise release carbon. Thus BFG emissions are considered equal to zero[10].
11	Other emission that are not attributed to the project	CO_2		excluded	

Table 35: Source of emissions in the Project scenario

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

[16] Such substances contain carbon that oxidizes to CO_2 in the atmosphere in, at maximum, twelve years. The revised Guidelines for National GHG inventories account for all the revised carbon as CO_2. Thus, in respect of the amount of GHG emissions, the release of them in the open air has the same effect than firing them in boilers.

Date of completion of the baseline setting: 17th November 2008

The entity setting the baseline is:
MWH S.p.A.
Centro Direzionale Milano 2 – Palazzo Canova
20090 Segrate (Mi) – Italy

Mr. Eugenio Ferro
Tel.: +39 02 21084 375
Fax : +39 02 2692 4275
E-mail: eugenio.ferro@mwhglobal.com

MWH is not a project participant.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Energy Efficiency Measure	Starting date	Commissioning Date
1. Modernization of Air Separating Unit:	Jan 08	Mar-09
2. Modernization of Compressors station	Jan 08	Aug-08
3. Switch fuel from NG to COG+BFG+NG mixtures	Jan 08	Jul-08
4. Refurbishment of Energy Distribution System	Jan 08	Jan 09
5. New Gas Burner Installation	Jan 08	Apr-08
7. Turbo Generators Installation	Jan 08	Jan-10
8. BF top recovery turbine installation	Jan 09	Jan 11
9. Heat recovery in Refractory and Lime Rotary Kilns	Jan 08	Jan-11

Table 36: Starting date for the sub-projects activities

C.2. Expected operational lifetime of the project:

For all proposed measures, the lifetime of equipment will be, at least, 15 years.

C.3. Length of the crediting period:

Start of the crediting period: 1 April 2008 (to be changed according to the effective registration date of the project).

The present Project seeks ERUs under Art.6 of the KP, from the starting date of 01-04-2008 till 31-12-2012, for a total of 4 years and 9 months.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

This monitoring plan (MP) has been established in accordance with appendix B of the JI guidelines and taking account of guidance on criteria for baseline setting and monitoring developed by the JISC.

None of the existing approved methodologies can be directly applied to the project. In the preparation of the present MP reference from the following documents has been made, adapting them to each single specific sub-project:

- Guidance on criteria for baseline setting and monitoring;
- Approved consolidated baseline and monitoring methodology ACM0012 – Version 03(sub-project 6,7,8);
- Approved Simplified baseline and monitoring methodology AMS-II.C - Version 09 (sub-project 1, 2);
- Approved Simplified baseline and monitoring methodology AMS-II.A – Version 09 (sub-project 4);
- Approved consolidated baseline and monitoring methodology ACM0009 – Version 03 (sub-project 3, 5).

The project involves eight different interventions:

1. Modernization of Air Separating Unit:
2. Modernization of Compressors station
3. Switch fuel from NG to COG+BFG+NG mixtures
4. Refurbishment of Energy Distribution System
5. New Gas Burner Installation
6. Turbo Generators Installation
7. BF top recovery turbine installation
8. Heat recovery in Refractory and Lime Rotary Kilns

These interventions will involve savings of electricity and natural gas. Total energy consumption, and consequent total GHG emission in the project scenario, can be evaluated directly from the future consumption. In order to calculate emission reduction, comparison with the baseline will be done by performing ex-post analysis and taking into account any possible fluctuation in the production level.
Since emission reduction are calculated and monitored separately for each sub-project, the risk to fall into double counting is avoided.
The detailed approach to monitoring and use of measuring system has not been described in this PDD. At this point of time - prior to detailed design stage - it is an assumption only. The detailed design of measuring systems for each sub-project will be conducted during sub-project execution. The monitoring and measuring equipment will be supplied, installed and commissioned during sub-project implementation phase.
Before the starting of the monitoring activities a monitoring manual for each subproject will be prepared and sent for Initial verification to an Accredited Independent Entity (AIE). Monitoring manual will be then kept updated during the implementation stage of each subproject.
All relevant information about data used in the present Monitoring section is attached in the annex 2 and in the“baseline worksheets” included to the present PDD as part of annex 2.

Project emissions

The project emissions are mainly emissions of CO_2 from the burning process of natural gas and from electricity generation elsewhere on the Ukrainian electricity System. They are estimated by direct calculation of the consumption of electricity and natural gas.

Emission Factor (EF) of 1.9 Kg per m^3 of natural gas in determining the amount of emission reductions for fuel combustion was used. This value is calculated starting from the IPCC value of 0.0561 tCO_2/GJ and considering the Net Calorific Value (NCF) for natural gas provided by the plant, equal to 8,106 $kcal/Nm^3$. Both these values will be updated on yearly basis.

The estimation of emissions reduction from electricity saving is based on a carbon emission factor of 896 grams per kWh. This EF for the Ukrainian Electricity Grid refers to the document “Standardized emission factor for the Ukrainian electricity grid”, version 5 dated 2 February 2007. The complete document is included in Annex 2 for consultation. Possible updates of the document during the monitoring period will be taken into account.

In order to facilitate the monitoring operations, an excel-model has been prepared and included as Annex 3 to the present PDD. By using the monitored data as input (yellow cells), the model automatically calculates the project and the baseline emissions for each year after the project commissioning. The electronic worksheets will be filled with updated information through the whole duration of the crediting period.

Baseline emissions

Baseline scenario is the continuation of current situation before implementation of the Project. The Baseline emissions will be calculated ex-post on the basis of future operations and, in case, by using specific baseline energy consumptions of equipment that is being replaced due to the project implementation.

The production levels are multiplied with the specific baseline factors to determine the consumption of electricity and natural gas that would have occurred without the implementation of the proposed Project. The energy consumptions are then converted in CO_2 emissions by applying the same EF and NCF used for project emission calculations.

In the following sections, all data to be monitored and formulae related to the project and baseline scenarios are provided for each sub-project.

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

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

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1 PEy	*Project emissions in the project scenario*	*Monitoring of GHG in year y for sub-project*	*tCO_2*	*c*	*yearly*	*100%*	*Electronic and paper*	
2 $PE_{SPi,y}$	*Project Emissions after implementation of Sub Projects i in the year y in the section of the plant object of the sub-project i*	*Monitoring of GHG in year y for the Sub-Project i-th*	*tCO_2*	*c*	*yearly*	*100%*	*Electronic and paper*	
3 $EF_{el,y}$	*Emission Factor for Ukrainian Electricity Grid*	*See Annex 2 (ex ante calculation)*	*tCO_2/MWh*	*c*	*yearly*	*100%*	*Electronic and paper*	*Updated version of the Standardized Guidelines will be used*
4 $EF_{NG,y}$	*Emission Factor of Natural Gas*	*Based on IPCC Value*	*tCO_2/Nm^3*	*c*	*yearly*	*100%*	*Electronic and paper*	*Based on updated IPCC value*

5 NCV_{NG}	*Net Calorific Value of Natural Gas*	*Division of Automatic Process Control System*	*Kcal /Nm³*	*m*	*monthly*	*100%*	*Electronic and paper*	
6 $EC_{SPi,PS,y}$	*Electricity consumption for the Sub-Project i-th in year y*	*Plant record electricity counter*	*MWh/y*	*m*	*Continuously*	*100%*	*Electronic and paper*	
7 $NG_{SPi,PS,,y}$	*Natural Gas Consumption for the Sub-Project i-th in the year y*	*Plant Record Gas flow meter*	*N m³/y*	*m*	*Continuously*	*100%*	*Electronic and paper*	
8 $BFG_{SPi,PS,,y}$	*Blast Furnace Gas Consumption for the Sub-Project i-th in the year y*	*Plant Record Gas flow meter*	*Nm³/y*	*m*	*Continuously*	*100%*	*Electronic and paper*	
9 $COG_{SPi,PS,,y}$	*Coke Oven Gas Consumption for the Sub-Project i-th in the year y*	*Plant Record Gas flow meter*	*Nm³/y*	*m*	*Continuously*	*100%*	*Electronic and paper*	
10 NCV_{BFG}	*Net Calorific Value of Blast Furnace Gas*	*Central Heating Technical Laboratory of Power Engineering and Power Saving Dept.*	*Kcal /Nm³*	*m*	*monthly*	*100%*	*Electronic and paper*	
11 NCV_{COG}	*Net Calorific Value of Coke Oven Gas*	*Central Heating Technical Laboratory of Power Engineering and Power Saving Dept.*	*Kcal /Nm³*	*m*	*monthly*	*100%*	*Electronic and paper*	
12 OP,ps,y	*Oxygen production in the year y for Sub-project 1*	*Plant record gas flow meter*	*m³Oxygen/y*	*m*	*yearly*	*100%*	*Electronic and paper*	
13 $SC_{OP,PS,y}$	*Specific consumption of Compressed Air for Oxygen Production in the Project scenario*	*Monitoring of specific consumption in year y.*	*Nm³/m³*	*m*	*yearly*	*100%*	*Electronic and paper*	

14 $SEC_{CAP,PS,y}$	*Specific Electricity Consumption for Compressed Air Production in the Project scenario*	*Monitoring of specific consumption in year y.*	*kWh/Nm^3*	*m*	*yearly*	*100%*	*Electronic and paper*	
15 $CA_{c,PS,y}$	*Compressed Air consumption in the Project scenario*	*Plant metering system*	*Nm3/y*	*m*	*yearly*	*100%*	*Electronic and paper*	
16 $APA_{SP2,PS,y}$	*Average power absorbed in the project scenario for sub- project 2*	*Amper-meter*	*Ampere*	*m*	*yearly*	*100%*	*Electronic and paper*	*Based on measurement during the year*
17 $T_{AC,PS,y}$	*Operating hours of compressors object of Sub-Project 2 in the year y*	*Monitoring of operating hours of compressors*	*h/y*	*m*	*continuously*	*100%*	*Electronic and paper*	*Full load and total*
18 $EC_{SP4,pS,y}$	*Electricity consumption for the Sub-Project 4 in year y*	*Metering system*	*MWh/y*	*c*	*yearly*	*100%*	*Electronic and paper*	
19 rpi,y	*Average reactive power absorbed during the year y in the sub-station object of sub-project i*	*Metering system to monitor reactive power*	*Mvarh/y*	*m*	*yearly*	*100%*	*Electronic and paper*	
20 Cosφi,y	*Power factor for each sub-station object of sub-project i in the year y*	*Metering system*		*m*	*yearly*	*100%*	*Electronic and paper*	*The parameters are constantly monitored over the years of operation – please see data for Year-to date 2009 in annex 2.*
21 UTL	*Ukrainian Transmission Losses*	*literature*	*%*	*m*	*yearly*	*100%*	*Electronic and paper*	*www.eia.doe.gov/emeu/cabs/Ukraine/*

								Electricity.html
22 $EC_{C,SP4,PS,y}$	*Current Consumption for Active power transmission Production in the Project scenario*	*Monitoring of specific consumption in year y.*	*kWh/Nm³*	*c*	*yearly*	*100%*	*Electronic and paper*	
23 $ST_{SP8,PS,y}$	*Temperature of the steam produced by the waste heat recovery boilers associated with the implementation on measure n.8*	*Based on measurement at the plant*	*°C*	*m*	*Continuously*	*100%*	*Electronic and paper*	
24 $SP_{SP8,PS,y}$	*Pressure of the steam produced by the waste heat recovery boilers associated with the implementation on measure n.8*	*Based on measurement at the plant*	*Atm*	*m*	*Continuously*	*100%*	*Electronic and paper*	
25 $SF_{SP8,PS,y}$	*Average flow rate of the steam produced by the waste heat recovery boilers associated with the implementation on measure n.8*	*Based on measurement at the plant*	*m³/h*	*m*	*yearly*	*100%*	*Electronic and paper*	

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

Project emissions (PE) will be estimated by the following formulae:

$$PE_y = \sum_{i=1}^{8} PE_{SPi,y} \qquad \text{(b.1)}$$

Where:

PE_y = Project Emissions in year y [tCO_2];

$PE_{SPi,y}$ = Project Emission for the "i-th" Sub-Project in year y [tCO_2].

Project Emissions associated with the implementation of Sub-Project #1

The project emissions are defined as emission that occur after implementation of the project activity to meet the oxygen production of the new ASU object of this sub-project.

The following data will be monitored:

- Specific electric consumption for compressed air production;
- Oxygen production;
- Compressed air consumption in the ASU;
- Operating hours;
- CO_2 emission factor of electricity.

The emission coefficient for the Ukrainian Electricity Grid refers to the document "Standardized emission factor for the Ukrainian electricity grid", version 5 dated 2 February 2007. The complete document is included in Annex 2 for consultation. Average power absorbed will be monitored by using calibrated instruments to measure the average amperage, and by using the cosφ values monitored at the plant. Operating hours will be monitored by using data counters.

The project emissions can be calculated as follow:

$$PE_{SP1,y} = EC_{SP1,PS,y} \cdot EF_{el,y} \qquad \text{(b.2)}$$

With:

$$EC_{SP1,PS,y} = SC_{OP,PS,y} \cdot OP_{PS,y} \cdot EC_{CA,PS,y} \qquad \text{(b.3)}$$

Where:

$PE_{SP1,y}$ = Project emissions in year y for implementation of Sub-Project #1 [tCO_2];

$EC_{SP1,PS,y}$ = Electricity consumption of the plant in year y for implementation of Sub-Project #1 [kWh/y];

$EF_{el,y}$ = Carbon Emission Factor for Ukrainian grid in year y [tCO_2/MWh];

$SC_{OP,PS,y}$= Specific consumption of Compressed Air for Oxygen Production in the Project scenario [m^3Air/m^3 Oxygen];

$OP_{PS,y}$= Oxygen production in the ASU included in the project boundaries of the Sub-Project in the year y [m^3 Oxygen/y];

$EC_{CA,PS,y}$= electricity consumption for compressed air production for ASU included in the project boundaries of the Sub-Project in the year y[kWh/ m^3Air];

Project Emissions associated with the implementation of Sub-Project #2

The project emissions are defined as emission that occur after implementation of the project activity to meet the compressed air demand covered by the compressors object of the sub-project activity.

In order to calculate the electric consumption associated to the use of the compressors, the following data will be monitored:

- Average power absorbed;
- Operating hours;
- Full load operating hours;
- Compressed air production;
- CO_2 emission factor of electricity.

The emission coefficient for the Ukrainian Electricity Grid refers to the document “Standardized emission factor for the Ukrainian electricity grid”, version 5 dated 2 February 2007. The complete document is included in Annex 2 for consultation. Average power absorbed will be monitored by using calibrated instruments to measure the average amperage, and by using the cosφ values monitored at the plant. Operating hours will be monitored by using data counters.

The project emissions can be calculated as follow:

$$PE_{SP2,y} = EC_{SP2,PS,y} \cdot EF_{el,y} \qquad (b.4)$$

Where:

$PE_{SP2,y}$ = Project emissions in year y for implementation of Sub-Project #2 [tCO_2];

$EC_{SP2,PS,y}$ = Electricity consumption of the plant in year y for implementation of Sub-Project #2 [kWh/y];

$EF_{el,y}$ = Carbon Emission Factor for Ukrainian grid in year y [tCO_2/MWh].

Project Emissions associated with the implementation of Sub-Project #3

Project emissions include CO_2 emissions from the combustion of natural gas in all element processes[17] *i* in the project scenario. Project emissions are calculated based on the quantity of natural gas combusted in all element process *i* on the net calorific value and on CO_2 emission factor for natural gas. No emissions are associated to the combustion of BFG and COG, since emission factor for gases otherwise flared to the atmosphere can be considered equal to zero.

Emission Factor (EF) of 1.9 Kg per m^3 of natural gas in determining the amount of emission reductions for fuel combustion was used. This value is calculated starting from the IPCC value and considering the Net Calorific Value (NCF) for natural gas provided by the plant.

In order to calculate the natural gas consumption in the project scenario and to estimate the baseline emissions, the following data will be monitored:

- Natural Gas, COG and BFG consumption;
- Net calorific value of natural gas, BFG, and COG;
- CO_2 emission factor of natural gas (IPCC default value).

Fuel consumption will be monitored by using calibrated meters installed for each burner. Net calorific value is the value annually monitored at the plant.

[17] Fuel combustion in a single equipment at one point of the process included in the project boundaries.

$$PE_{SP3,y} = NG_{SP3,PS,y} \cdot NCV_{NG} \cdot EF_{NG,y} \qquad (b.5)$$

$$NG_{SP3,PS,y} = \sum_{i} NG_{SP3,PS,y,i} \qquad (b.6)$$

Where:

$PE_{SP3,Y}$ = Project emissions in year y for implementation of Sub-Project #3 [tCO_2];

$NG_{SP3,PS,y}$ = Natural Gas consumption in the plant sections object of the Sub-Project #3 [Nm^3/y];

$NG_{SP3,PS,y,i}$ = Natural Gas consumption in the element process i in the year y [Nm^3/y];

NCV_{NG} = Net Calorific Value for NG [kcal/ Nm^3].

$EF_{NG,y}$ = Emission Factor for NG combustion in year y [tCO_2/GJ].

Project Emissions associated with the implementation of Sub-Project #4

The energy project consumption is the technical losses of electric energy within the project boundaries calculated as the measured performance of the existing equipment with installed filter compensating devices, multiplied by the average electric transmission losses of the Ukrainian electricity Grid[18]. The Project emissions for the year y are determined by multiplying the energy project consumption with the emission coefficient of the Ukrainian electricity grid expressed in t CO_2/MWh. This coefficient for the Ukrainian Electricity Grid refers to the document “Standardized emission factor for the Ukrainian electricity grid”, version 5 dated 2 February 2007. The complete document is included in Annex 2 for consultation.

In order to calculate the electric consumption associated to the use of the compressors, the following data will be monitored:

- Reactive power absorbed;
- Power factor;
- Ukrainian Transmission losses
- CO_2 emission factor of electricity.

[18] http://www.eia.doe.gov/emeu/cabs/Ukraine/Electricity.html

The formulae can be summarized as follow:

$$PE_{SP4,y} = EC_{SP4,PS,y} \cdot EF_{el,y} \tag{b.7}$$

With:

$$EC_{SP4,PS,y} = \sum_i \frac{rp_i \cdot o_i \cdot UTL}{tg\varphi_i} \tag{b.8}$$

Where:

$PE_{SP4,y}$ = Project emissions in year y for implementation of Sub-Project #4 [tCO_2];

$EC_{SP4,PS,y}$ = Electricity consumption of the plant in year y for implementation of Sub-Project #4 [kWh/y];

$rp_{i,y}$ = average reactive power for the sub-station "ith" in the project scenario in year y [MVar];

o_i,= operating hours [h/y];

$\cos\varphi_{i,y}$ = average power factor for the sub-station "ith" where the energy efficiency equipment has been installed in year y;

UTL= Ukrainian electricity transmission losses from the grid [%].

EFel,y = Carbon Emission Factor for Ukrainian grid in year y [tCO_2/MWh].

Project Emissions associated with the implementation of Sub-Project #5

Project emissions include CO_2 emissions from the combustion of natural gas in all element processes *i* in the project scenario. Project emissions are calculated based on the quantity of natural gas combusted in all element process *I*, on the net calorific value, and on CO_2 emission factor for natural gas. No emissions are associated to the combustion of BFG and COG, since emission factor for gases otherwise flared to the atmosphere can be considered equal to zero.

Emission Factor (EF) of 1.9 Kg per m^3 of natural gas in determining the amount of emission reductions for fuel combustion was used. This value is calculated starting from the IPCC value and considering the Net Calorific Value (NCF) for natural gas provided by the plant.

In order to calculate the natural gas consumption in the project scenario and to estimate the baseline emissions, the following data will be monitored:

- Natural Gas, COG and BFG consumption;
- Net calorific value of natural gas, BFG, and COG;
- CO_2 emission factor of natural gas (IPCC default value).

Fuel consumption will be monitored by using calibrated meters installed for each burner. Net calorific value is the value annually monitored at the plant.

$$PE_{SP5,y} = NG_{SP5,PS,y} \cdot NCV_{NG} \cdot EF_{NG,y} \tag{b.9}$$

$$NG_{SP5,PS,y} = \sum_i NG_{SP5,PS,y,i} \tag{b.10}$$

Where:

$PE_{SP5,Y}$ = Project emissions in year y for implementation of Sub-Project #5 [tCO_2];

$NG_{SP5,PS,y}$ = Natural Gas consumption in the plant sections object of the Sub-Project #5 [Nm^3/y];

$NG_{SP5,PS,y,i}$ = Natural Gas consumption in the element process i in the year y [Nm^3/y];

NCV_{NG} = Net Calorific Value for NG [kcal/ Nm^3].

$EF_{NG,y}$ = Emission Factor for NG combustion in year y [tCO_2/GJ].

Project Emissions associated with the implementation of Sub-Project #6

Additional waste gas that will be combusted in the project scenario would have been flared into the atmosphere. Therefore, the emissions associated to the combustion of these gases will be considered equal to zero. However, project emissions include the emission due to possible natural gas combustion increase to provide the additional power output (in comparison with the baseline scenario). Emission Factor of natural gas in determining the amount of emission reductions for fuel combustion was calculated starting from the IPCC value and considering the Net Calorific Value (NCF) for natural gas provided by the plant.

The following data will be monitored for project emission calculation:

- Quantity of natural gas used to produce electricity;

- Net calorific value of natural gas;
- CO_2 emission factor for the natural gas;

The quantity of natural gas fired is measured using calibrated flow meter. Net calorific value is obtained by reliable local data at the plant.

The following formulae will be used to calculate project emissions

$$PE_{SP6,y} = NG_{SP6,PS,y} \cdot NCV_{NG} \cdot EF_{NG,y} + \qquad \text{(b.11)}$$

Where:

$PE_{SP6,Y}$ = Project emissions in year y for implementation of Sub-Project #6 [tCO_2];

$NG_{SP6,PS,y}$ = Natural Gas consumption in the plant sections object of the Sub-Project #6 [Nm^3/y];

NCV_{NG} = Net Calorific Value for NG [kcal/ Nm^3].

$EF_{NG,y}$ = Emission Factor for NG combustion in year y [tCO_2/GJ];

Project Emissions associated with the implementation of Sub-Project #7

Waste gas pressure coming from BF-9 would be released into the atmosphere in absence of the proposed sub-project. Therefore, the emissions associated to the use of this gas will be considered equal to zero.

The following formulae will be used to calculate project emissions. Expected project emission for this sub-project is zero.

$$PE_{SP7,y} = EC_{SP7,PS,y} \cdot EF_{el,y} \qquad \text{(b.12)}$$

Where:

$PE_{SP7,Y}$ = Project emissions in year y for implementation of Sub-Project #7 [tCO_2];

$EC_{SP7,PS,y}$ = Electricity consumption [kWh/y];

$EF_{el,y}$ = Carbon Emission Factor for Ukrainian grid in year y [tCO_2/MWh].

Project Emissions associated with the implementation of Sub-Project #8

The steam that would run the new 6 MW turbine would be wasted without the implementation of the project. No need of additional energy is required to run this turbine. Therefore, no emissions should be associated to the project scenario. Nonetheless, natural gas consumption will be monitored in order to include any possible emission related to the increasing of natural gas consumption if compared to the baseline scenario.

The following data shall be monitored for project emission calculation:

- Quantity of natural gas used in the project boundaries;
- Steam parameters (pressure, temperature, flow-rate);
- Net calorific value of natural gas;
- CO_2 emission factor for the natural gas;

The quantity of natural gas fired is measured using calibrated flow meter according to relevant industry standards. Net calorific value is obtained by reliable local data at the plant. Default factor published by IPCC will be used to estimate NG emission factor.

$$PE_{SP8,y} = NG_{SP8,PS,y} \cdot NCV_{NG} \cdot EF_{NG,y} \qquad \text{(b.13)}$$

Where:

$PE_{SP8,Y}$ = Project emissions in year y for implementation of Sub-Project #8 [tCO_2];

$NG_{SP8,PS,y}$ = Natural Gas consumption in the plant sections object of the Sub-Project #8 [Nm^3/y];

NCV_{NG} = Net Calorific Value for NG [kcal/ Nm^3].

$EF_{NG,y}$ = Emission Factor for NG combustion in year y [tCO_2/GJ];

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*	**Data variable**	**Source of data**	**Data unit**	**Measured (m), calculated (c),**	**Recording frequency**	**Proportion of data to be**	**How will the data be archived? (electronic/**	**Comment**

to D.2.)				**estimated (e)**		**monitored**	**paper)**	
1 BE_y	*Baseline Emissions related to all the project*	*Monitoring of GHG emission in year y*	tCO_2/y	*c*	*yearly*	*100%*	*Electronic and paper*	
2 $BE_{SPi,Y}$	*Baseline Emissions of Sub-Project i-th in the year y*	*Monitoring of GHG emission for measure i*	tCO_2/y	*c*	*yearly*	*100%*	*Electronic and paper*	
3 $EF_{el,y}$	*Emission Factor for Ukrainian Electricity Grid*	*See Annex 2*	tCO_2/MWh	*c*	*yearly*	*100%*	*Electronic and paper*	
4 EF_{NG}	*Emission Factor Natural Gas*	*Based on IPCC value*	tCO_2/Nm^3	*c*	*yearly*	*100%*	*Electronic and paper*	
5 NCV_{NG}	*Net Calorific Value of Natural Gas*	*Division of Automatic Process Control System*	$Kcal /Nm^3$	*m*	*monthly*	*100%*	*Electronic and paper*	
6 $EC_{SP1,BS,y}$	*Baseline Electricity consumption for the Sub-Project 1 in year y*	*Based on* $EC_{SP1,PS,y}$	*MWh/y*	*c*	*yearly*	*100%*	*Electronic and paper*	
7 $SC_{OP,BS,y}$	*Specific consumption of Compressed Air for Oxygen Production in the baseline scenario*	*Based on historical data*	Nm^3/m^3	*c*	*once*	*100%*	*Electronic and paper*	
8 $SC_{OP,PS,y}$	*Specific consumption of Compressed Air for Oxygen Production in the Project scenario*	*Monitoring of specific consumption in year y.*	Nm^3/m^3	*m*	*yearly*	*100%*	*Electronic and paper*	
9 $EC_{SP2,BS,y}$	*Baseline Electricity consumption for the Sub-Project 2 in year y*	*Based on* $EC_{SP2,PS,y}$	*MWh/y*	*c*	*yearly*	*100%*	*Electronic and paper*	

10 $SEC_{CAP,BS,y}$	*Specific Energy Consumption for Compressed Air Production in the baseline scenario*	*Based on historical data*	*kWh/Nm^3*	*c*	*once*	*100%*	*Electronic and paper*	
11 $SEC_{CAP,PS,y}$	*Specific Electric Consumption for Compressed Air Production in the Project scenario*	*Monitoring of specific consumption in year y.*	*kWh/Nm^3*	*m*	*yearly*	*100%*	*Electronic and paper*	
12 $NG_{SP3,BS,,y}$	*Natural Gas Consumption for the Sub-Project 3 in the year y*	*Based on Project Scenario thermal energy consumption*	*Nm^3/y*	*c*	*yearly*	*100%*	*Electronic and paper*	
13 $NG_{SP3,PS,,y}$	*Natural Gas Consumption for the Sub-Project 3 in the year y*	*Plant Record Gas flow meter*	*Nm^3/y*	*m*	*Continuously*	*100%*	*Electronic and paper*	
14 $BFG_{SP3,PS,,y}$	*Blast Furnace Gas Consumption for the Sub-Project 3 in the year y*	*Plant Record Gas flow meter*	*Nm^3/y*	*m*	*Continuously*	*100%*	*Electronic and paper*	
15 $COG_{SP3,PS,,y}$	*Coke Oven Gas Consumption for the Sub-Project 3 in the year y*	*Plant Record Gas flow meter*	*Nm^3/y*	*m*	*Continuously*	*100%*	*Electronic and paper*	
16 NCV_{BFG}	*Net Calorific Value of Blast Furnace Gas*	*Central Heating Technical Laboratory of Power Engineering and Power Saving Dept.*	*Kcal /Nm^3*	*m*	*monthly*	*100%*	*Electronic and paper*	

17 NCV_{COG}	*Net Calorific Value of Coke Oven Gas*	*Central Heating Technical Laboratory of Power Engineering and Power Saving Dept.*	*Kcal /Nm^3*	*m*	*monthly*	*100%*	*Electronic and paper*	
18 $EC_{SP4,BS,y}$	*Baseline Electricity consumption for the Sub-Project 4 in year y*	*Based on $EC_{SP4,PS,y}$*	*MWh/y*	*c*	*yearly*	*100%*	*Electronic and paper*	
19 $Cos\varphi i,_{BS,y}$	*Power factor of sub-station i in the year y*	*Historical data*		*m*	*once*	*100%*	*Electronic and paper*	*The parameters are constantly monitored over the years of operation – please see data for Year-to date 2009 in annex 2.*
20 $EC_{C,BS,y}$	*Current Active Power transmission in the baseline scenario*	*Based on historical data of cosφ and of $EC_{C,PS,y}$*	*Ampere*	*c*	*yearly*	*100%*	*Electronic and paper*	
21 $EC_{C,PS,y}$	*Current Active power transmission in the Project scenario*	*Monitoring of specific current in the wire in year y.*	*Ampere*	*c*	*yearly*	*100%*	*Electronic and paper*	
22 $NG_{SP5,BS,,y}$	*Natural Gas Consumption for the Sub-Project 5 in the year y*	*Based on Project Scenario thermal energy consumption*	*Nm^3/y*	*c*	*yearly*	*100%*	*Electronic and paper*	
23 $NG_{SP5,PS,,y}$	*Natural Gas Consumption for the Sub-Project 5 in the year y*	*Plant Record Gas flow meter*	*Nm^3/y*	*m*	*Continuously*	*100%*	*Electronic and paper*	

24 $BFG_{SP5,PS,,y}$	*Blast Furnace Gas Consumption for the Sub-Project 5 in the year y*	*Plant Record Gas flow meter*	*Nm^3/y*	*m*	*Continuously*	*100%*	*Electronic and paper*	
25 $COG_{SP5,PS,,y}$	*Coke Oven Gas Consumption for the Sub-Project 5 in the year y*	*Plant Record Gas flow meter*	*Nm^3/y*	*m*	*Continuously*	*100%*	*Electronic and paper*	
26 $NG_{SP6,BS,y}$	*Natural Gas consumption in the plant sections object of the Sub-Project 6 in baseline scenario*	*Historical baseline data*	*Nm^3/y*	*m*	*once*	*100%*	*Electronic and paper*	
27 $EC_{SP6,BS,y}$	*Quantity of electricity supplied which, in absence of the project activity would have sourced from the grid in year y.*	*Monitoring of electricity produced in project scenario for Sub-Project 6 and Ex ante calculation of baseline electricity production*	*MWh/y*	*m*	*yearly*	*100%*	*Electronic and paper*	
28 $EP_{SP6,PS,y}$	*Quantity of electricity produced by the project activity #6 in year y.*	*Monitoring of electricity produced in project scenario for Sub-Project 6*	*MWh/y*	*m*	*yearly*	*100%*	*Electronic and paper*	
29 $EP_{SP6,BS,y}$	*Quantity of baseline electricity produced in the HPP object of sub-project #6*	*Ex ante calculation*	*MWh/y*	*m*	*once*	*100%*	*Electronic and paper*	

30 $EP_{SP7,BS,y}$	*Quantity of electricity supplied by the project activity which, in absence of the project activity would have sourced from the grid in year y after implementation of Sub-Project #7*	*Monitoring of electricity produced in project scenario for Sub-Project #7*	*MWh/y*	*m*	*Monthly*	*100%*	*Electronic and paper*	
31 $NG_{SP8,BS,y}$	*Natural Gas consumption in the plant sections object of the Sub-Project #8 in baseline scenario*	*Historical baseline data*	*Nm^3/y*	*m*	*once*	*100%*	*Electronic and paper*	
32 $EC_{SP8,BS,y}$	*Quantity of electricity supplied by the project activity which, in absence of the project activity would have sourced from the grid in year y after implementation of Sub-Project #8*	*Monitoring of electricity produced in project scenario for Sub-Project #8*	*MWh/y*	*m*	*Monthly*	*100%*	*Electronic and paper*	
33.$ST_{SP8,BS,y}$	*Temperature of the steam produced by the waste heat recovery boilers associated with the lime kilns*	*Historical baseline data*	*C°*	*m*	*once*	*100%*	*Electronic and paper*	
34.$SP_{SP8,BS,y}$	*Pressure of the steam produced by the waste heat recovery boilers associated with the lime kilns*	*Historical baseline data*	*Atm*	*m*	*once*	*100%*	*Electronic and paper*	

35.$SF_{SP8,BS,y}$	*Annual average flow rate of the steam produced by the waste heat recovery boilers associated with the lime kilns*	*Historical baseline data*	*m^3/h*	*m*	*once*	*100%*	*Electronic and paper*	

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

Baseline emissions

Baseline emissions (BE) will be estimated by the following formulae:

$$BE_y = \sum_{i=1}^{8} BE_{SPi,y} \qquad (c.1)$$

Where:

BE_y = Baseline Emissions in year y [tCO_2];

$BE_{SPi,y}$ = Baseline Emission for the "i-th" Sub-Project in year y [tCO_2].

Baseline Emissions associated with the implementation of Sub-Project #1

The energy baseline is defined as the energy consumption that would have occurred in absence of the project activity to meet the equivalent oxygen air production obtained in the project scenario from the project boundary.

The following data will be monitored:

- Electricity consumption for compressed air production;
- Compressed air consumption in the ASU;
- Baseline ex-ante specific compressed air consumption for oxygen production;
- CO_2 emission factor of electricity.

The energy baseline will be calculated based on the electric consumption for compressed air availability at the ASU, and taking into account the different specific compressed air consumption between the old and the new configuration to produce oxygen. The baseline emission are calculated by multiplying the energy baseline times the emission coefficient for the Ukrainian Electricity Grid included the document "Standardized emission factor for the Ukrainian electricity grid", version 5 dated 2 February 2007. The complete document is included in Annex 2 for consultation.

$$BE_{SP1,y} = EC_{SP1,BS,y} \cdot EF_{el,y} \qquad (c.2)$$

with:

$$EC_{SP1,BS,y} = EC_{SP1,PS,y} \cdot \frac{SC_{OP,BS,y}}{SC_{OP,PS,y}}; \qquad (c.3)$$

Where:

$BE_{SP1,y}$ = Baseline emissions in year y without implementation of Sub-Project #1 [tCO_2];

$EC_{SP1,BS,y}$ = Baseline energy consumption [MWh];

$EC_{SP1,PS,y}$ = project scenario energy consumption [MWh];

$EF_{el,y}$ = Carbon Emission Factor for Ukrainian grid in year y [tCO_2/MWh];

$SC_{OP,BS,y}$= Specific consumption of Compressed Air for Oxygen Production in the baseline scenario [m^3Air/m^3 Oxygen];

$SC_{OP,PS,y}$= Specific consumption of Compressed Air for Oxygen Production in the Project scenario [m^3Air/m^3 Oxygen].

Baseline Emissions associated with the implementation of Sub-Project #2

The baseline emissions are defined as emission that would have occurred in absence of the project activity to meet the equivalent compressed air output obtained in the project scenario from the project boundary.

The following data will be monitored:

- Electricity consumption;
- Baseline ex-ante specific electric consumption for oxygen production
- CO_2 emission factor of electricity.

The baseline emissions will be calculated based on the electric consumption of the refurbished compressors and taking into account the different specific electric consumption between the old and the new compressors configuration and operating parameters. The emission coefficient for the Ukrainian Electricity Grid refers to the document "Standardized emission factor for the Ukrainian electricity grid", version 5 dated 2 February 2007. The complete document is included in Annex 2 for consultation.

$$BE_{SP2,y} = EC_{SP2,BS,y} \cdot EF_{el,y} \qquad (c.4)$$

with:

$$EC_{SP2,BS,y} = EC_{SP2,PS,y} \cdot \frac{SEC_{CAP,BS,y}}{SEC_{CAP,PS,y}}; \qquad (c.5)$$

Where:

$BE_{SP2,y}$ = Baseline emissions in year y without implementation of Sub-Project #2 [tCO_2];

$EC_{SP2,PS,y}$ = Electricity consumption of the plant in year y for implementation of Sub-Project #2 [kWh/y];

$EC_{SP2,BS,y}$ = Electricity consumption in the Baseline Scenario in year y [MWh];

$EF_{el,y}$ = Carbon Emission Factor for Ukrainian grid in year y [tCO_2/MWh];

$SEC_{CAP,BS,y}$= Specific Energy Consumption for Compressed Air Production in the baseline scenario [kWh/m^3CompAir];

$SEC_{CAP,PS,y}$= Specific Energy Consumption for Compressed Air Production in the Project scenario [kWh/m^3CompAir].

Baseline Emissions associated with the implementation of Sub-Project #3

Baseline emissions include CO_2 emissions from the combustion of the quantity of natural gas that would be used in the element processes included in the project boundary in absence of the proposed project activity. Baseline emissions are calculated based on the quantity of natural gas that would be combusted in each element process i in the absence of the project activity, and respective net calorific value, and CO_2 emission factor.

The quantity of natural gas that would be used in the absence of the project activity in an element process *i* is calculated based on the actual monitored quantity of natural gas, COG and BFG combusted in the element process and the relation of the net calorific values between the project scenario and the baseline scenario.

Emission Factor of natural gas in determining the amount of emission from fuel combustion was calculated starting from the IPCC value and considering the Net Calorific Value for natural gas provided by the plant.

The following data will be monitored:

- Natural Gas, COG and BFG consumption;
- Net calorific value of natural gas, BFG, and COG;
- CO_2 emission factor of natural gas (IPCC guidelines default value).

Fuel consumption will be monitored by using calibrated meters installed for each burner. Net calorific value is the value annually monitored at the plant.

The Baseline emissions for the year y are determined as follow:

$$BE_{SP3,y} = NG_{SP3,BS,y} \cdot NCV_{NG} \cdot EF_{NG,y} \qquad \text{(c.6)}$$

With

$$NG_{SP3,BS,y} = \sum_i \left(NG_{SP3,PS,y,i} \cdot NCV_{NG} + COG_{SP3,PS,y,i} \cdot NCV_{COG} + BFG_{SP3,PS,y,i} \cdot NCV_{BFG} \right) / \, NCV_{NG} \qquad \text{(c.7)}$$

Where:

$BE_{SP3,Y}$ = Baseline emissions in year y for implementation of Sub-Project #3 [tCO_2];

$NG,_{SP3,BS,y}$ = Natural Gas consumption in the plant sections object of the Sub-Project #3 (baseline scenario) [Nm^3/y];

NCV_{NG} = Net Calorific Value for NG [kcal/ Nm^3].

$EF_{NG,y}$ = Emission Factor for NG combustion in year y [tCO_2/GJ].

$NG,_{SP3,PS,y,i}$ = Natural Gas consumption in the element process i (Project scenario) [Nm^3/y];

$COG,_{SP3,PS,y,i}$ = COG consumption in the element process i (Project scenario) [Nm^3/y];

NCV_{COG} = Net Calorific Value for COG [kcal/ Nm^3].

$BFG,_{SP3,PS,y,i}$ = BFGs consumption in the element process i (Project scenario) [Nm^3/y];

NCV_{BFG} = Net Calorific Value for BFG [kcal/ Nm^3].

Baseline Emissions associated with the implementation of Sub-Project #4

The energy baseline is the technical losses of electric energy within the project boundaries calculated as the measured performance of the existing equipment multiplied by the average electric transmission losses of the Ukrainian electricity Grid. The Baseline emissions for the year y are determined by multiplying the energy baseline with the emission coefficient of the Ukrainian electricity grid expressed in t CO_2/MWh. This coefficient for the Ukrainian Electricity Grid refers to the document “Standardized emission factor for the Ukrainian electricity grid”, version 5 dated 2 February 2007. The complete document is included in Annex 2 for consultation.

The following data will be monitored:

- Quantity of electricity that would have been consumed by the plant in the absence of this sub-project activity;
- Reactive power absorbed;
- Operating hours;
- Baseline ex-ante Power factor;
- CO_2 emission factor of electricity.

The baseline emissions will be calculated based on the electric consumption of the refurbished sub-station in the project scenario and taking into account the different power factor between the old and the new sub-stations configuration.

The Baseline emissions for the year y are determined as follow:

$$BE_{SP4,y} = EC_{SP4,BS,y} \cdot EF_{el,y} \qquad \text{(c.8)}$$

with:

$$EC_{SP4,BS,y} = EC_{SP4,PS,y} \cdot \left(\frac{EC_{C,BS,y}}{EC_{C,PS,y}} \right)^2; \qquad \text{(c.9)}$$

$$EC_{C,BS,y} = \sum_i \frac{rp_i}{tg\varphi_{i,BS,y}} \qquad \text{(c.10)}$$

$$EC_{C,PS,y} = \sum_{i} \frac{rp_i}{tg\varphi_{i,y}} \qquad (c.11)$$

Where:

$BE_{SP4,y}$ = Baseline emissions in year y without implementation of Sub-Project #4 [tCO_2];

$EC_{SP4,BS,y}$ = Electricity consumption in the Baseline Scenario [MWh];

$rp_{i,y}$ = average reactive energy for the sub-station "ith" in the project scenario in year y [MVarh/y];

$o_{i,}$= operating hours in the year y [h/y];

$\cos\varphi_{i,BS,y}$ = ex ante average power factor for the sub-station "ith" where the energy efficiency equipment has been installed;

$\cos\varphi_{i,y}$ = average power factor for the sub-station "ith" where the energy efficiency equipment has been installed in year y;

$EC_{SP4,PS,y}$ = Electricity consumption in the Project Scenario in year y [MWh];

$EF_{el,y}$ = Carbon Emission Factor for Ukrainian grid in year y [tCO_2/MWh];

$EC_{C,BS,y}$= Current Consumption for Active Power transmission in the baseline scenario [A];

$EC_{C,PS,y}$= Current Consumption for Active power transmission Production in the Project scenario [A];

Baseline Emissions associated with the implementation of Sub-Project #5

Baseline emissions include CO_2 emissions from the combustion of the quantity of natural gas that would be used in the element processes included in the project boundary in absence of the proposed project activity. Baseline emissions are calculated based on the quantity of natural gas that would be combusted in each element process i in the absence of the project activity, respective net calorific value, and CO_2 emission factor.

The quantity of natural gas that would be used in the absence of the project activity in an element process *i* is calculated based on the actual monitored quantity of natural gas, COG and BFG combusted in the element process and the relation of the net calorific values between the project scenario and the baseline scenario.

Emission Factor of natural gas in determining the amount of emission from fuel combustion, was calculated starting from the IPCC value and considering the Net Calorific Value for natural gas provided by the plant.

The following data will be monitored:

- Natural Gas, COG and BFG consumption;

- Net calorific value of natural gas, BFG, and COG;
- CO_2 emission factor of natural gas (IPCC guidelines default value).

Fuel consumption will be monitored by using calibrated meters installed for each burner. Net calorific value is the value annually monitored at the plant.

The Baseline emissions for the year y are determined as follow:

$$BE_{SP5,y} = NG_{SP5,BS,y} \cdot NCV_{NG} \cdot EF_{NG,y} \quad (c.12)$$

With

$$NG_{SP5,BS,y} = \sum_i \left(NG_{SP5,PS,y,i} \cdot NCV_{NG} + COG_{SP5,PS,y,i} \cdot NCV_{COG} + BFG_{SP5,PS,y,i} \cdot NCV_{BFG} \right) / NCV_{NG} \quad (c.13)$$

Where:

$BE_{SP5,Y}$ = Baseline emissions in year y for implementation of Sub-Project #5 [tCO_2];

$NG_{,SP5,BS,y}$ = Natural Gas consumption in the plant sections object of the Sub-Project #5 (baseline scenario) [Nm^3/y];

NCV_{NG} = Net Calorific Value for NG [kcal/ Nm^3].

$EF_{NG,y}$ = Emission Factor for NG combustion in year y [tCO_2/GJ].

$NG_{,SP5,PS,y,i}$ = Natural Gas consumption in the element process i (Project scenario) [Nm^3/y];

$COG_{,SP5,PS,y,i}$ = COG consumption in the element process i (Project scenario) [Nm^3/y];

NCV_{COG} = Net Calorific Value for COG [kcal/ Nm^3].

$BFG_{,SP5,PS,y,i}$ = BFGs consumption in the element process i (Project scenario) [Nm^3/y];

NCV_{BFG} = Net Calorific Value for BFG [kcal/ Nm^3].

Baseline Emissions associated with the implementation of Sub-Project #6

The baseline emissions are defined as emission that would have occurred in absence of the project activity to meet the equivalent power output obtained in the project scenario within the project boundary. The Baseline emissions for the year y are determined by the emission coefficient of the Ukrainian electricity grid expressed in t CO_2/MWh. This coefficient for the Ukrainian Electricity Grid refers to the document "Standardized emission factor for the Ukrainian electricity grid", version 5 dated 2 February 2007. The complete document is included in Annex 2 for consultation. Emission from natural gas combustion will be calculated based on the historical natural gas consumption times the emission Factor calculated starting from the IPCC value and considering the Net Calorific Value for natural gas provided by the plant.

The following data will be monitored:

- Quantity of electricity supplied by the project activity which, in absence of the project activity would have sourced from the grid;
- Baseline ex-ante electricity generation;
- Baseline ex-ante fuel consumption;
- CO_2 emission factor of electricity.

Advanced monitoring and control system that will measure in real time electricity generation from the turbine will be installed.

The Baseline emissions for the year y are determined as follow:

$$BE_{SP6,y} = NG_{SP6,BS,y} \cdot NCV_{NG} \cdot EF_{NG,y} + EC_{SP6,BS,y} \cdot EF_{el,y} \quad (c.14)$$

$$EC_{SP6,BS,y} = EP_{SP6,PS,y} - EP_{SP6,BS,y} \quad (c.15)$$

Where:

$BE_{SP6,Y}$ = Baseline emissions in year y for implementation of Sub-Project #6 [tCO_2];

$NG_{SP6,BS,,y}$ = Natural Gas consumption in the plant sections object of the Sub-Project #6 in baseline scenario [Nm^3/y];

NCV_{NG} = Net Calorific Value for NG [kcal/ Nm^3].

$EF_{NG,y}$ = Emission Factor for NG combustion in year y [tCO_2/GJ];

$EC_{SP6,BS,y}$ = electricity consumption from the grid given by the difference between the electricity generated in the project scenario, in year y after implementation of Sub-Project #6 minus the electricity that would have been generated in the baseline scenario (ex.- ante value) in [MWh/y];

$EC_{SP6,PS,y}$ = Quantity of electricity produced in the project scenario, in year y after implementation of Sub-Project #6 in [MWh/y];

$EP_{SP6,BS,y}$ = Quantity of electricity produced in the HPP object of sub-project #6 in the baseline scenario (ex.- ante value) in [MWh/y];

$EF_{el,y}$ = Carbon Emission Factor for Ukrainian grid in year y [tCO_2/MWh].

Baseline Emissions associated with the implementation of Sub-Project #7

The baseline emissions are defined as emission that would have occurred in absence of the project activity to meet the equivalent power output obtained in the project scenario from the project boundary. The Baseline emissions for the year y are determined by using the emission coefficient of the Ukrainian electricity grid expressed in t CO_2/MWh. This coefficient for the Ukrainian Electricity Grid refers to the document "Standardized emission factor for the Ukrainian electricity grid", version 5 dated 2 February 2007. The complete document is included in Annex 2 for consultation.

The following data will be monitored:

- Quantity of electricity supplied by the project activity which, in absence of the project activity would have sourced from the grid;
- CO_2 emission factor of electricity.

Advanced monitoring and control system that will measure in real time t electricity generation from the turbine will be installed.

The Baseline emissions for the year y are determined as follow:

$$BE_{SP7,y} = EC_{SP7,BS,y} \cdot EF_{el,y} \qquad (c.16)$$

Where:

$BE_{SP7,Y}$ = Baseline emissions in year y for implementation of Sub-Project #7 [tCO_2];

$EC_{SP7,BS,y}$ = delta of electricity consumption from the grid if compared with the project scenario, in year y after implementation of Sub-Project #7 [kWh/y];

$EF_{el,y}$ = Carbon Emission Factor for Ukrainian grid in year y [tCO_2/MWh].

Baseline Emissions associated with the implementation of Sub-Project #8

The baseline emissions are defined as emission that would have occurred in absence of the project activity to meet the equivalent power output obtained in the project scenario from the project boundary. The Baseline emissions for the year y are determined by using the emission coefficient of the Ukrainian electricity grid expressed in t CO_2/MWh. This coefficient for the Ukrainian Electricity Grid refers to the document "Standardized emission factor for the Ukrainian electricity grid", version 5 dated 2 February 2007. The complete document is included in Annex 2 for consultation. Emission from natural gas combustion will be calculated based on the historical natural gas consumption times the emission Factor calculated starting from the IPCC value and considering the Net Calorific Value for natural gas provided by the plant.

The following data will be monitored:

- Quantity of electricity supplied by the project activity which, in absence of the project activity would have sourced from the grid

- Baseline ex-ante fuel consumption;
- Baseline ex-ante steam parameters (temperature, pressure, flow rate).
- CO_2 emission factor of electricity.

The Baseline emissions for the year y are determined as follow:

$$BE_{SP8,y} = NG_{SP8,BS,y} \cdot NCV_{NG} \cdot EF_{NG,y} + EC_{SP8,BS,y} \cdot EF_{el,y} \quad (c.17)$$

Where:

$BE_{SP8,Y}$ = Baseline emissions in year y [tCO_2];

$NG_{SP8,BS,,y}$ = Baseline emissions from generation of steam using additional natural gas [Nm^3/y];

NCV_{NG} = Net Calorific Value for NG [kcal/ Nm^3].

$EF_{NG,y}$ = Emission Factor for NG combustion in year y [tCO_2/GJ];

$EC_{SP8,BS,y}$ = baseline emission from electricity generated by the project activity during the year y [MWh/y];

$EF_{el,y}$ = Carbon Emission Factor for Ukrainian electricity grid in year 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.):

D.1.2.1. Data to be collected in order to monitor emission reductions from the project, and how these data will be archived:

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

Not applicable

D.1.2.2. Description of formulae used to calculate emission reductions from the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

Not applicable

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

The proposed Sub-Projects will not affect the steel production level, but only the efficiency of processes and the electricity production. These interventions do not affect emissions outside the project boundaries except those avoided by reducing electricity consumption from the Ukrainian Electricity grid. Moreover, these measures reduce both electricity and NG consumption, and all leakages that may result from eventual fugitive emissions associated with fuel extraction, processing, liquefaction, transportation, re-gasification and distribution of NG, and distribution of electricity, would be reduced by the Project activity.

Based on such considerations, in order to be conservative, no leakages were identified for any of the proposed sub-projects. For these reasons this section is not applicable.

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):

The annual emission reductions are being calculated as follow:

$$ER_y = BE_y - PE_y \quad (d.1)$$

where:

ER_y = Emission reductions of the project in the year y [tCO_2];

BE_y = Baseline Emissions in year y [tCO_2];

PE_y = Project Emissions in year y [tCO_2].

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:

Since the main environmental impacts due to the development of the Project consist in a reduction of emissions to the atmosphere, no worsening of environmental conditions is foreseen. It is otherwise reasonable to expect an improvement of air quality. Thus, since no environmental impacts of this project are foreseen, this section is not applicable.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:

Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
D.1.1.1-3 *D.1.1.3-3*	*Low*	*Annual revision of the "Standardized electricity baseline for Ukraine" see annex 2*
D.1.1.1-4 *D.1.1.3-4*	*Low*	*Annual revision of IPCC Guidelines and default Values*
D.1.1.1-7;8;9;12;13;14;15;25 *D.1.1.3-7;8;10;11;12;13;14;15;22;23;24;25;26;31;35*	*Low*	*Flow Meters will be subject to regular testing and maintenance regime to ensure accuracy*
D.1.1.1-5;10;11; *D.1.1.3-5;16;17;*	*Low*	*Calorific values are subject to regular calculations by specific laboratories*
D.1.1.1-6;14;16;18;19;20;22; *D.1.1.3-9;10;11;18;19;20;21; 27;28,29,30;32;*	*Low*	*Electricity Meters will be subject to regular testing and maintenance regime to ensure accuracy*

D.1.1.1-17; *D.1.1.3-*	*Low*	*Operating hour Meters will be subject to regular testing and maintenance regime to ensure accuracy*
D.1.1.1-23, *D.1.1.3-33*	*Low*	*Thermometers will be subject to regular testing and maintenance regime to ensure accuracy*
D.1.1.1-24 *D.1.1.3-34*	*Low*	*Manometers will be subject to regular testing and maintenance regime to ensure accuracy*
	Low	*Statement of compliance with national/international (ISO 9001) standards for regular testing and maintenance*

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

In the context of JI projects, the monitoring plan describes the systematic surveillance of a project's performance by measuring and recording performance-related indicators relevant to the project or activity.

This Monitoring Plan (MP) defines a standard against which the implementation of the energy efficiency measures performs in terms of its GHG reductions, in conformance with all relevant JI-project monitoring criteria.

The MP builds on the baseline scenario identified in the baseline and is fully consistent with it. The MP provides the basis for the projection of the GHG emissions reductions (ERUs) that the project expects to generate over its lifetime.

The MP also provides a practical framework for the collection and management of project performance data, which will be used for retrospective verification of actual ERUs generated. This MP provides sufficient detail on the project structure, the proposed data monitoring methodologies and relevant operational issues, to allow an independent verifier to develop suitable auditing and verification procedures.

The MP will constitute integral part of ArcelorMittal complex of Kryviy Quality Management and it will be embedded in the existent certified ISO-9000 quality procedures at the plant.

The MP must be used by the operator when planning and implementing the project activity and during the project's operation. Adherence to the instructions in the MP is necessary for the project operators to measure and track the project impacts and prepare for the verification process that must be undertaken to confirm the achieved ERUs. The MP is thus the basis for the production and delivery of ERUs, and for any related revenue stream that the operator expects to receive. A transparent procedure for the collection and storage of data, including adequate record keeping and data monitoring systems will be established.

For electronic and paper based data entry and record keeping system, there must be clarity in terms of the procedures, workbooks and spreadsheets, so that compliance with requirements can be assessed by a third party.

Particular reference will be drawn to the data uncertainty and scientific and systematic error in monitoring, and to the impact of uncertain data on reported emissions and to how this is managed.

A competent manager must be appointed who will be accountable for the generation of ERUs including monitoring, record keeping, computation of ERUs, audits and verification.

Proper management processes and systems records will be kept by the operator as the auditors will request copies of such records to judge compliance with the required management systems.

The MP must be used throughout the life of the project by being:

- Adopted as a key input into the detailed planning of the project; and
- Included into the operational manuals of the implemented projects.

The MP can be updated and adjusted to meet operational requirements, accordingly with the verifier during the process of initial or periodic verification.

In order to ensure a successful operation of the project and the credibility and verifiability of the ERUs achieved, the project must have a well defined management and operational system. It is the obligation of the operator to put such a system in place for the project. It must include the operation and management of the monitoring and record keeping system that is described in this MP. The proper functioning of the project management and operational system must be monitored by the operator and will be subject to third party verification as far as the ability of the project to generate credible carbon credits is concerned. Therefore, the project management responsibilities that concern this MP are outlined in this section.

Allocation of Project Management Responsibilities

The management and operation of the project is the responsibility of AMKR (the project operator). Ensuring the environmental credibility of the project through accurate and systematic monitoring of the project's implementation and operation, is the key responsibility of the operator as far as this MP is concerned. The operator will be ultimately held to account for the quality of the carbon credits generated.

The project operator will have responsibility to carry out all tests and analyses required under this MP, to procure and install all the necessary equipment and data acquisition systems to enable the collection and of the stipulated data at the required frequency, and to manage and present this data to meet the needs of this MP and the independent verifier.

Independent verifiers will audit the operator and their management systems to ensure credibility and transparency of the project's reported ERUs and other performance indicators.

Maintenance

Preventive maintenance program is developed by ArcelorMittal KR in conjunction with Business unit maintenance program and Original Equipment Manufacturer warranty conditions.

The Department of the maintenance of capital assets (http://www.mittalsteel.com.ua/) administers the arrangement of prospective and current planning of basic industrial and production assets (BIPA).

In addition the Power department (http://www.mittalsteel.com.ua/) is responsible for the continuous supply of all energy resources with corresponding parameters, management of the activities on power and electric equipment maintenance as well as technically correct operations and correctly –timed maintenance of power and electric equipment in power shops. The program is to comply with Ukrainian standards, rules and regulation.

A detailed Maintenance Scheme will be carried out as soon as vendor selection, establishment of performance guarantee, and warranty conditions have been finalised.

Provided here is a generic example on preventive maintenance scheme for ASU. Each subproject will have developed maintenance strategy based on vendor requirements and compliance with local and international standards.

Example: Overview of deployed preventive maintenance and repair scheme as recommended by the OEM of Air Separation Units (ASU).

- Current repair (T);

- Medium-term repair (C);
- Capital repair (K).

CURRENT REPAIR:

The scope covers the following activities:

- Elimination of defects that hinder operation of unit before planned shut down;
- Execution of work related to replacement of rubber seal ring of valves and actuator, revision of reversing mechanism; repair of pneumatically operated valves
- Checking and filling up of absorbent in absorbers columns.
- Checking of control instruments, manometers with calibrated instruments.
- Replacement of couplings and gland seal of pump for oxygen, nitrogen, argon.
- Elimination of leakages in flange connection of fluid lines;
- Elimination of cracks on casing of the block
- Revision of turbo-expander,
- Revision of switching system actuated valves.

MEDIUM-TERM REPAIR

The scope covers the following activities:

- In addition to the current repair jobs,
- Checking of leakages in high, medium and low pressure systems, heat-exchangers and discharge collector; elimination of leakages.
- Repair of heat exchanging units. Cleaning of insulating material in pipe-lines

- Repair of valve with seats.
- Replacement of actuators, valves and reversing valves.
- Revision and regulation of safety valves;
- Replacement of turbo-expander -filters, gear boxes etc.
- Replacement of plunger pumps of liquid oxygen, argon.
- Replacement of bearings of centrifugal pump of liquid oxygen ЦН- 239
- Revision and repair of switching mechanism;
- Pressure testing of block by dry air.
- Repair of scrubbers with cleaning and inspection of vessels;
- Tightening of flange connections, testing of impulse lines and testing of the lines.
- Replacement of insulation material.
- Repair of block casing and internal separating walls.
- Technical examination of vessels (inspection of internal and external surface of vessels);
- Warm pressure test of block.
- Screening of silica gel.

CAPITAL REPAIR

The scope covers the following activities:

- Total removal of heat insulating materials.
- Pressure- testing of high, medium and low pressure system and elimination leakages.
- Checking of pipe system, pipe clamping system.

- Repair/replacement of separators.
- Pressure testing of heating and discharge collectors. Eliminate all detected leakages.
- Replacement of turbo-expander internals, rotors, guides.
- Pressure testing (hydro- or pneumatic test) of vessels as per standard procedure- И-928
- Replacement of casing of block, manholes, and painting of the block.
- Cold and hot pressure test
- Filling of casing with the insulating material
- Restoration of heat insulation- sound proofing;
- Replacement of mufflers.
- Replacement of all major pumps.
- Repair of heat exchangers.

Recommended repair strategy for ASU's in Russia.								
ASU no. Existing	Type of Blocks	Repair cycle	Maintenance periodicity			Duration of maintenace in calander days		
			Capital repairs in years (K)	Medium repairs in Years (C)	Current repairs in months (T)	Capital (K)	Medium (C)	Current (T)
1 & 2	KtK - 35-2	K - 7T - C - 7T - C - 7T - C - 7T - K	8	2	3	80	27	2
3	KA 13.5	K – 3T – C - 3T – C – 3T – C – 3T – C – 3T – C – 3T – C – 3T – K	8	1	3	60	20	1
4	KtK - 35-3	K - 7T - C - 7T - C - 7T - C - 7T - K	8	2	3	90	25	2
6	Kap- 30	K - 7T - C - 7T - C - 7T - C - 7T - K	8	2	3	90	25	2
7 & 8	K 15 - 3	K – 3T – C - 3T – C – 3T – C – 3T – C – 3T – C – 3T – C – 3T – K	8	1	3	60	20	1

Table 37: Recommended repair strategy example

Schedule of capital repair of building and equipment for 2009														
	Name of object	Areas	Month											
			1	2	3	4	5	6	7	8	9	10	11	12
1	Air division block KTK-35-2 ст 4 авар.	Air division area1			К	К	К	К						
2	Air division block KA-13,5 ст 3	Air division area1												
3	Air division block KAP-30 ст 6	Air division area2												
4	Air division block KA-15-3 ст 8	Air division area2								К	К			
5	turbo compressor K-3000-61-1 ст 2	Air compression area												
6	turbo compressor K-3000-61-1 ст 5	Air compression area		К	К									
7	K-1500-62-2 № 3	Air compression area				К								
8	K-1500-62-2 № 8	Air oxygen compression area												
9	K-1500-62-2 № 11	Air oxygen compression area												
	K-1500-62-2 № 12	Air oxygen compression area									К			
10	K-1500-62-2 № 13	Air oxygen compression area												
11	K-1500-62-2 № 15	Air and nitrogen compression area										К		
12	т/к KTK-12,5/35 № 2	Air and nitrogen compression area												
	т/к KTK-12,5/35 № 3	Air and nitrogen compression area					К	К						
13	т/к KTK-12,5/35 № 4	Air and nitrogen compression area									К			
14	т/к KTK-12,5/35 № 6	Air and nitrogen compression area												
	KTK-12,5/35 № 7	Air oxygen compression area							К					
15	KTK-12,5/35 № 10	Air oxygen compression area									К			
16	ЦК-135 № 1	Air and nitrogen compression area												
17	K-345 № 5	Compressor station												
18	ЦТК-275/9 ст. № 4	Compressor station												
19	K-500 ст. № 3	Compressor station										К		
20	2ТГ-80 ст № 3													
21	2ТГ-80 ст № 5													
22	Transformer TM-630													

Table 38: Example of schedule of capital repair

Name of object	year of installation	Schedule of capital repair carried out in number of days									
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Air division block KTK-35-2 cт 1	1970		jun/90 days				jun/90c			sep/60 days	
Air division block KTK-35-2 cт 2	1970	nov/60 days	jan/90 days	feb/90 days	dec/30 days	jan.90 days		jun/60 days	sept/30 days		
Air division block KA-13,5 cт 3	1972				oct/45 days						
Air division block KTK-35-3 cт 4	1974		dec/30 days	jan/60 days		nov/30 days			nov/60 days		
Air division block KAP-30 cт 6	1978			oct/90 days		nov/60 days		oct/60 days	march/120 days	jul/60 days	
Air division block KA-15-3 cт 7	1985		jul/30 days			may/30 days	jan/30 days			may/60 days	
Air division block KA-15-3 cт 8	1986		apr/60 days				feb/30 days				

Table 39: Example of schedule of capital repair

Activities	AMKR Operator and Management	Responsible
Monitoring system	Review MP and suggest adjustments if necessary Develop and establish management and operations system Establish and maintain monitoring system and implement MP	Energy Mgr.
Data Collection	Establish and maintain data measurement and collection systems for all MP indicators Check data quality and collection procedures regularly	Energy Mgr.
Data computation	Enter date in MP workbook	Energy Mgr.
Data storage systems	Implement record maintenance system Forward annual worksheet outputs	Energy Mgr.
Performance monitoring and reporting	Analyse data and compare project performance with project targets Analyse system problems and recommend improvements (performance management) Prepare and forward periodic reports	Ecology and environment director
Quality assurance, audit and verification	Establish and maintain quality assurance system with a view to ensuring transparency and allowing for audits and verification Prepare for, facilitate and co-ordinate audits and verification process	Ecology and environment director

Table D.3: MP management and operating system

In order to mitigate possible monitoring errors (such as wrong meter readings or input errors) and uncertainties, a double stage control system will be applied.

First, required data will be collected and prepared by the responsible manager for on site data collection. After passing this control, data will be used within the Monitoring Plan Spreadsheet for preliminary GHG emission reduction calculation. The second screening consists of a final approval of preliminary results from the Project Manager.

The person responsible for the collection of the required data, recording and reporting is:

Mr Vladimir Volkov, Energy Management Energy TCO Group Leader

phone: +38 0564 783826;

e-mail: Vladimir.Volkov@arcelormittal.com

The person responsible for implementation of monitoring plan and reporting is:

Ms Liana Maksimenko, Ecology and Environment Director

phone: +38 0564 78 46 27;

e-mail: Liana.Maksimenko@arcelormittal.com

Reporting

The operator will prepare reports as needed for annual audit and verification purposes.

A report will be prepared on an annual basis, which includes: information on overall project performance, emission reductions generated and verified and comparison with targets, observations regarding MP indicators, compliance with sustainable development targets, calculation methods and other amendments of the MP and the monitoring system.

Training

All personnel involved in the implementation, management, operation & maintenance, and monitoring of the energy efficiency measures that constitute the JI project is to be well trained and aware of role and responsibilities assigned to each of them.

It is the responsibility of Management to ensure that the required capacity and internal training is made available to its operational staff to enable them to undertake the tasks required by this MP and by the project as a whole.

An energy training needs analysis will be undertaken before project implementation, in order to ensure all personnel possesses the requisite skills required to correctly apply the MP. Wherever the training need analysis shows lacks of technical or managerial competences, training courses will be developed to overcome these gaps.

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

MWH S.p.A.

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20090 Segrate (Mi) – Italy

Mr. Eugenio Ferro

Tel.: +39 02 21084 375

Fax : +39 02 2692 4275

E-mail: eugenio.ferro@mwhglobal.com

MWH is not a project participant.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Total estimated Project Emissions during the crediting period are 3,692,723 ton CO_2.

#	Sub-project	UoM	2008	2009	2010	2011	2012	Total
1	Modernization of Air Separating Unit	tCO_2/y	0	82,201	109,602	109,602	109,602	411,007
2	Modernization of compressor station	tCO_2/y	24,939	179,558	299,264	418,970	478,822	1,401,553
3	Switch fuel from NG to COG+BFG+NG Mixture	tCO_2/y	113,718	227,437	227,437	227,437	227,437	1,023,464
4	Refurbishment of Energy distribution System	tCO_2/y	0	75,462	75,462	75,462	75,462	301,849
5	New Gas Burner Installation	tCO_2/y	0	69,455	91,156	102,006	102,006	364,624
6	Turbo Generators installation	tCO_2/y	0	0	31,270	79,478	79,478	190,226
7	BF Top recovery Turbine installation	tCO_2/y	0	0	0	0	0	0
8	Heat Recovery in Refractory Rotary Kilns	tCO_2/y	0	0	0	0	0	0
	Total	**tCO_2/y**	**138,657**	**634,114**	**834,191**	**1,012,954**	**1,072,807**	**3,692,723**

Table 40: Overview of expected Project emissions

E.2. Estimated leakage:

Not applicable

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

As there are not estimated leakages, the sum of E.1 and E.2 is equal to the point E.1: 3,692,723 ton CO_2

E.4. Estimated baseline emissions:

Total estimated baseline emissions during the crediting period are 5,296,424 ton CO_2.

#	Sub-project	UoM	2008	2009	2010	2011	2012	Total
1	Modernization of Air Separating Unit	tCO_2/y	0	97,869	130,492	130,492	130,492	489,344
2	Modernization of compressor station	tCO_2/y	27,425	197,460	329,100	460,740	526,560	1,541,286
3	Switch fuel from NG to COG+BFG+NG Mixture	tCO_2/y	137,639	275,277	275,277	275,277	275,277	1,238,747
4	Refurbishment of Energy distribution System	tCO_2/y	0	122,735	122,735	122,735	122,735	490,939
5	New Gas Burner Installation	tCO_2/y	0	83,531	107,635	119,687	119,687	430,540
6	Turbo Generators installation	tCO_2/y	0	0	135,699	368,650	368,650	872,999

#	Sub-project	UoM	2008	2009	2010	2011	2012	Total
7	BF Top recovery Turbine installation	tCO_2/y	0	0	0	86,016	86,016	172,032
8	Heat Recovery in Refractory Rotary Kilns	tCO_2/y	0	0	0	30,269	30,269	60,538
	Total	**tCO_2/y**	**165,064**	**776,872**	**1,100,937**	**1,593,866**	**1,659,686**	**5,296,424**

Table 41: Overview of expected Baseline Emissions

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

The emission reductions expected for the project implementation are:

5,296,424 - 3,692,723 = 1,603,701 ton CO_2.

#	Sub-project	UoM	2008	2009	2010	2011	2012	Total
1	Modernization of Air Separating Unit	tCO_2/y	0	15,667	20,890	20,890	20,890	78,337
2	Modernization of compressor station	tCO_2/y	2,486	17,902	29,836	41,771	47,738	139,733
3	Switch fuel from NG to COG+BFG+NG Mixture	tCO_2/y	23,920	47,841	47,841	47,841	47,841	215,282
4	Refurbishment of Energy distribution System	tCO_2/y	0	47,272	47,272	47,272	47,272	189,090
5	New Gas Burner Installation	tCO_2/y	0	14,076	16,479	17,681	17,681	65,916
6	Turbo Generators installation	tCO_2/y	0	0	104,429	289,172	289,172	682,773
7	BF Top recovery Turbine installation	tCO_2/y	0	0	0	86,016	86,016	172,032
8	Heat Recovery in Refractory Rotary Kilns	tCO_2/y	0	0	0	30,269	30,269	60,538
	Total	**tCO_2/y**	**26,407**	**142,758**	**266,747**	**580,911**	**586,878**	**1,603,701**

Table 42: Overview of expected Emissions Reductions

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

Year	Estimated Project emissions (tonnes of CO_2 equ.)	Estimated leakage (tonnes of CO_2 equ.)	Estimated baseline emissions (tonnes of CO_2 equ.)	Estimated emission reductions (tonnes of CO_2 equ.)
Year 2008	138,657	n.a	165,064	26,407
Year 2009	634,114	n.a	776,872	142,758
Year 2010	834,191	n.a	1,100,937	266,747
Year 2011	1,012,954	n.a	1,593,866	580,911
Year 2012	1,072,807	n.a	1,659,686	586,878
Total (tonnes of CO_2 equ.)	3,692,723	n.a	5,296,424	1,603,701

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 investment program is largely environmentally oriented, improves the efficiency in use of resources.

Analysis of environmental impacts of the sub-projects have been carried out and can be summarized as follow:

#	Sub-Project	Status
1	Modernization of Air Separating Unit	OVOS(*), positive agreement from the Min.Ecology № 636 dated 19.05.08
2	Modernization of compressor station	According PKMU(LAW)№ 1269 from 31.10.2007 п. 1 about building objects , No OVOS is required for this sub-project.
3	Switch fuel from NG to COG+BFG+NG Mixture	OVOS, positive agreement from the Min.Ecology № 466 dated 15.03.07
4	Refurbishment of Energy distribution System	According PKMU(LAW)№ 1269 from 31.10.2007 п. 1 about building objects , No OVOS is required for this sub-project.
5	New Gas Burner Installation	According PKMU(LAW)№ 1269 from 31.10.2007 п. 1 about building objects , No OVOS is required for this sub-project.
6	Turbo Generators installation	OVOS will be required not earlier than in 2009(**).
7	BF Top recovery Turbine installation	OVOS will be required not earlier than in 2009(**).
8	Heat Recovery in Refractory Rotary Kilns	OVOS will be required not earlier than in 2009(**).

(*) Otsenka Vozdeyistviya na Okruzhayushchuyu Sredu, (or Environmental Impact Assessment)

(**) OVOS will be required not earlier than 2009. These projects were included into AMKR Business plan – preliminary design stage has been planned for 2009. Because of current economical situation the projects execution might be delayed till 2010. OVOS will be required after design stage has been completed and ecological impact has been identified. Then it's going to be communicated through media to stakeholders in order to obtain their approval. Then OVOS by authorized organization will take place. Environmental approval process will be initiated during project execution.

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:

Up to date, according to Ukrainian Legislation, Environmental Impact Assessment has been performed for Sub-Project n.1 and for Sub-Project n.3.

Approval from Ukrainian Ministry of Ecology on sub-project 1 was obtained, with reference to Legislation n.4 article 37 of Ukrainian law on ecological expertise.

Approval from Ukrainian Ministry of Ecology on sub-project 3 was obtained, with reference to Legislation n.4 article 37 of Ukrainian law on ecological expertise.

Please refer to Annex 5 for references.

SECTION G. Stakeholders' comments

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

The procedure undertaken for stakeholder consultation can be summarised as follow:

1) AMKR makes announcement in newspaper;
2) Stakeholders meeting takes place;
3) The official body conducts expertise, and government (Ministry of Ecology) approves/disapproves the project

Results of such stakeholder processes for sub-Project n.1 and sub-project n.3 is included as Annex 5 to the present PDD.

OVOS for sub-project n.6, n.7, and n.8 will be provided after design stage has been completed and ecological impacts have been identified. After completion, they will follow the Stakeholder consultation described above.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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State/Region:	
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Country:	Ukraine
Phone:	
Fax:	
E-mail:	
URL:	www.arcelormittal.com
Represented by:	
Title:	
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Last name:	Maksimenko
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Organisation:	Arcelor Mittal Flat Carbon Europe S.A. Trade registry number: LUXBG B 2.050
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URL:	www.arcelormittal.com
Represented by:	
Title:	
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Personal e-mail:	alex.churilov@arcelormittal.com

Annex 2

BASELINE INFORMATION

a) BASELINE WORKSHEETS

b) CASH FLOW ANALYSIS (Financial Analysis parameters)

c) FINAL STATEMENTS AND STANDARDIZED GUIDELINES FOR UKRAINIAN ELECTRICITY GRID

d) GENERAL INFORMATION OF SUB-PROJECTS

c) FINAL STATEMENTS AND STANDARDIZED GUIDELINES FOR UKRAINIAN ELECTRICITY GRID

Industrie Service

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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

Headquarters: Munich
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Westendstrasse 199
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Germany

Our reference/Date: IS-USC-MUC/ / 17.08.2007

TÜV SÜD Industrie Service

origin of the data. The team consists of:

- Werner Betzenbichler (Head of the certification Body "Climate and Energy"),
- Thomas Kleiser (Head of division JI/CDM, GHG-Auditor and Project Manager)
- Markus Knödlseder (GHG-Auditor and Project Manager)

Mr. Kleiser and Betzenbichler assessed the baseline approach and agreed with Global Carbon on the conclusive approach. Mr. Kleiser and Mr. Knödlseder assessed the calculation model whereas Mr. Knödlseder interviewed also Mr. Nikolay Andreevich Borisov, Deputy Director for Strategic Development in Ministry of Fuel and Energy (+380 (44) 2349312 // borisov@mintop.energy.gov.ua) who explained the process of data gathering in the Ukraine. He also confirmed that GlobalCarbon B.V. uses the served data.

Conclusion

The conclusive assessment does not include potential uncertainties that might be occurred in the data gathering process of the ministry. Considering that we confirm that applied data served by Ministry of Fuel and Energy are reliable and correctly used.

Based on submitted calculation method, developed baseline study (see attachment), applied data and written confirmation from Ministry of Fuel and Energy (see attached documents) the team of Carbon Management Service of TÜV SÜD Industrie Service GmbH with its accredited certification body "Climate and Energy" confirms further that developed approach is eligible to determine the Ukrainian electricity grid factor as a standard value for JI project in the Ukraine.

The team recommends updating the calculation annually depending on point of time when national consolidated data are available.

Munich,17/08/2007

Markus Knödlseder

GHG-Auditor and Project Manager

Munich, 17/08/2007

Werner Betzenbichler

Head of the certification Body "Climate and Energy" and Carbon Management Service

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 (IET) 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[1];
- The "Operational Guidelines for the Project Design Document", further referred to as ERUPT approach or baseline [2];
- The approved CDM methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" [3];
- 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

[1] Guidance on criteria for baseline setting and monitoring, version 01, Joint Implementation Supervisory Committee, ji.unfccc.int
[2] Operational Guidelines for Project Design Documents of Joint Implementation Projects. Ministry of Economic Affairs of the Netherlands, May 2004
[3] Consolidated baseline methodology for grid-connected electricity generation from renewable sources, version 06, 19 May 2006, cdm.unfccc.int

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.

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[4]

Development of the Ukrainian electricity sector
The National Energy Strategy[5] 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[6]:

- 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

[4] Ukrenergo, http://www.ukrenergo.energy.gov.ua/ukrenergo/control/uk/publish/article?art_id=39047&cat_id=35061
[5] http://mpe.kmu.gov.ua/fuel/control/uk/doccatalog/list?currDir=50505
[6] Energy Strategy of Ukraine for the Period until 2030, section 16.1, page 127.

fossil-powered plants of which many are mothballed. These moth-balled plants might be connected to the grid in case of growing demand.

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[7]

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'[8].

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[9]

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)[10].

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.

[7] Source: Ukraine Energy Policy Review. OECD/IEA, Paris 2006. p. 272, table 8.1
[8] Source: Ukraine Energy Policy Review. OECD/IEA, Paris 2006. p. 269
[9] Ministry of Energy, letter dated 11 January 2007
[10] 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[11]

ACM0002 offers several choices for calculating the OM. Dispatch data analysis cannot be applied, since the grid data is not available[12]. 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[13]

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

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

[13] "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 CO2 emission coefficient of fuel I (tCO2 / 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 CO2 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 CO2 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[14]. The majority of the electricity (up to 95%) is generated centrally and therefore the data is comprehensive[15].

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[16] 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

[14] "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.

[15] 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.

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

the grid are 10%. This means that the actual reduction in electricity *production* is 111,111 MWh. Therefore a reduction of 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[17]

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[18] 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[19];
- 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:

[17] "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.

[18] 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.

[19] "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.

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

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 (tCO2/MWh);
$EF_{grid,reduced,y}$	is the emission factor for JI projects reducing electricity consumptionfrom the grid (tCO2/MWh)factor of the fuel;
$EF_{OM,y}$	is the simple OM of the Ukrainian grid (tCO2/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 (tCO2);
$EF_{grid,produced,y}$	is the emission factor of producing projects (tCO2/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 (tCO2/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
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Global Carbon B.V.
Version 5, 2 February 2007

Letter from Ministry of Energy 02.08.07

МІНІСТЕРСТВО ПАЛИВА ТА ЕНЕРГЕТИКИ УКРАЇНИ
(Мінпаливенерго України)

ДЕПАРТАМЕНТ СТРАТЕГІЧНОЇ ПОЛІТИКИ ТА ПЕРСПЕКТИВНОГО РОЗВИТКУ ПЕК
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01.08.2007 № 15/15-1-428

На № ____ від ____

Томасу Кляйзеру, ТЮВ

Шановний пане Кляйзер,

Висилаю Вам відповіді на ваші питання стосовно розробки базового рівня для визначення українського стандартизованого коефіцієнту викидів електромережі:

1) Для того, щоб дати пояснення стосовно недоступності даних диспетчеркького центру енергосистеми, я хочу поінформувати Вас, що ці дані є конфіденційними. Тому ні Міністерство палива та енергетики України ні Український диспетчерський центр енергосистеми «Укренерго» не можуть передати ці дані для користування для розробки базового рівня для визначення українського стандартизованого коефіцієнту викидів електромережі.
2) Хочу також підтвердити, що атомні електростанції не можуть задовольнити повністю потребу в електроенергії в години мінімального споживання (вночі), оскільки загальна потужність українських АЕС дорівнює 13,8 ГВт, і наприклад, мінімальне споживання в 2005 році було 3 липня в 03:00 і складало 14,53 ГВт.

3) Я підтверджую, що гідроелектростанції не забезпечують базисне завантаження електроенергії в Україні. Дивіться нижче малюнок з графіком кривих по генерації окремо для кожного типу електростанцій за 19 липня 2007 р.

4) Я підтверджую, що на протязі останніх 10 років тільки два нових блока електростанцій (Рівенська АЕС, 4 блок і Хмельницька АЕС, 2 блок) були під'єднані до української електромережі (в 2004). За останні 10 років ніякі інші великі електростанції не були введені в експлуатацію і під'єднані до електромережі в зв'язку з загальною надлишковою потужністю електромережи.

Ми маємо плани по будівництву нових електростанцій для заміни технічно застарілих ТЕС, але ці електростанції не будуть побудовані до 2012 року. Винятком можуть бути малі ГЕС і промислові ТЕЦ. Але ці електростанції не є частиною національної електромережі, яка регулюється Укренерго.

З повагою,
Заступник директора Департаменту стратегічної політики і перспективного розвитку ПЕК

Н.А. Борисов

ADDITIONAL BASELINE INFORMATION

Capital repairs of ASU in AMKR

2004 г. ASU BR-2 №8 (КС-1)

BR-2M №4 (КС-2)

2005 г. ASU KAR-30 №6

BR-2M №5

KAR-30 M1 №7 (auxiliary equipment)

2006 г. ASU BR-2M №1

2007- 2008 г. ASU KAR-30 №8

2008 г. KAR-30 M1 №7 (auxiliary equipment)

2009 г. ASU KAR-30 №6

NON-SCHEDULED OXYGEN PRODUCTION AIR SEPARATION PLANT SHUTDOWNS IN 2007

Plant	No. of shut-downs	Total shutdown time		
		hours	minutes	*in minutes*
BR-2№8	**4**	**16**	**30**	*990*
BR-2M №1	**8**	**106**	**35**	*6,395*
BR-2M №3	**5**	**579**	**30**	*34,770*
BR-2M №4	**7**	**421**	**10**	*25,270*
BR-2M №5	**16**	**200**	**20**	*12,020*
KAR-30№6	**6**	**39**	**10**	*2,350*
KAR-30 M1№7	**3**	**120**	**10**	*7,210*
KAR-30№8	**1**	**7**	**25**	*445*
TOTAL in 2007	50	**1490**	**50**	*89,450*
			in hours	*1490.8333*
			in days	*62.118056*

Plant	№	Date	Shutdown time hours	minutes	Reason for shutdown
BR-2№8	1	3/23/2007	0	15	Nitrogen regenerator V air valve failure
	2	6/5/2007	4	15	Blower TG-360 motor cooler failure
	3	6/8/2007	7	30	Nitrogen regenerator VI casing breakage
	4	9/11/2007	4	30	Air scrubber II casings breakage (flaw) of nitrogen regenerator IV
		Total	**16**	**30**	
BR-2M	1	5/8/2007	4	15	VD-4 shutoff fitting failure (air cooling device pump)

№1	2	6/1/2007	7	0	Z-96 shutoff fitting failure (air supply into nitrogen regenerator III)
	3	7/9/2007	30	0	Z-80 shutoff fitting failure (air supply into block). Gas valve failure of nitrogen regenerator III
	4	7/26/2007	4	5	Second pair nitrogen regenerators transfer valves failure
	5	9/4/2007	13	5	TDR-42-5M #1 shutoff fitting failure
	6	10/1/2007	29	10	Z-49 shutoff fitting failure (process oxygen into shop header)
	7	10/17/2007	8	30	Oxygen regenerator bypass valve failure
	8	11/26/2007	10	30	R-3, R-4 shutoff fittings failure (nitrogen supply to upper column)
		Total	**106**	**35**	
BR-2M №3	1	4/23/2007	360	0	Liquid nitrogen leakage on the piping upstream gate valve R-4 in intrablock space
	2	7/10/2007	159	25	Worsening oxygen analysis due to bypass in major condensers
	3	7/22/2007	6	10	Z-31 shutoff fitting failure (air intake into CO2 adsorber #1). Nitrogen regenerator I air valve failure
	4	11/14/2007	6	15	Nitrogen regenerator III casing breakage
	5	11/28/2007	47	40	Z-6 shutoff fitting failure (loop flow from oxygen regenerators)
		Total	**579**	**30**	
BR-2M №4	1	2/13/2007	6	5	Nitrogen regenerator IV transfer valve failure Oxygen regenerator II dump valve servo failure Nitrogen regenerator I gas valve casing breakage
	2	5/11/2007	13	5	Nitrogen regenerator IV casing failure in the point of loop flow take-off
	3	7/11/2007	11	40	Valve #604 failure (water supply to nitrogen scrubbers)
	4	7/23/2007	21	45	VD-3 shutoff fitting failure (water supply to air cooling device pump)
	5	8/29/2007	4	40	Nitrogen regenerator I dump valve failure
	6	9/8/2007	360	0	Liquid leakage in intrablock space
	7	12/26/2007	3	55	Nitrogen regenerator IV casing breakage
		Total	**421**	**10**	
BR-2M №5	1	1/18/2007	8	40	Nitrogen regenerator II casing breakage
	2	1/26/2007	7	45	Nitrogen regenerator IV casing breakage
	3	2/2/2007	17	20	Nitrogen regenerator IV automatic gas valve failure
	4	2/22/2007	3	10	Nitrogen regenerators I and IV casings breakage
	5	3/22/2007	9	30	Nitrogen regenerator IV automatic gas valve failure
	6	5/11/2007	12	0	Oxygen regenerator II casing weld breakage
	7	5/24/2007	8	15	Nitrogen regenerator IV casing breakage

	8	7/28/2007	12	40	Nitrogen regenerators I, II, and III casing breakage
	9	7/31/2007	10	55	Nitrogen regenerator I casing breakage
	10	9/10/2007	27	15	R-7 shutoff fitting failure (nitrogen supply from lower condenser of krypton column)
	11	9/22/2007	9	45	R-7 shutoff fitting failure (nitrogen supply from lower condenser of krypton column), R-4 (nitrogen supply from lower column to upper column)
	12	10/2/2007	8	30	R-4 shutoff fitting failure (nitrogen supply from lower column to upper column)
	13	10/12/2007	10	15	Oxygen regenerator II and nitrogen regenerators III & IV casing breakage
	14	11/16/2007	9	15	Nitrogen regenerators I pair bypass valve failure
	15	11/20/2007	6	45	Nitrogen regenerator I casing breakage
	16	12/14/2007	38	20	Nitrogen regenerator IV casing breakage
		Total	**200**	**20**	
KAR-30№6	1	3/21/2007	7	5	Oxygen regenerators I & XII casing breakage
	2	7/12/2007	8	50	Oxygen regenerator XI casing breakage Transfer valves V-4, V-9 failure (air intake into regenerators)
	3	8/23/2007	5	55	Transfer valves V-4, A-4 failure (air supply)
	4	9/5/2007	7	55	Air valves II & V and II dump valve failure
	5	9/19/2007	2	15	Casing breakage at the air inlet into regenerator X
	6	11/5/2007	7	10	Transfer valves V-4, V-7 failure (air inlet into oxygen regenerators). Regenerator XI coil tubes breakage.
		Total	**39**	**10**	
KAR-30 M1№7	1	1/15/2007	102	40	Steam heater tubes breakage, steam inflow from tube into intertubular space
	2	7/21/2007	8	40	Steam heater tubes breakage, steam inflow from tube into intertubular space. Disturbance of thermal mode of chilling machines' condenser-evaporator.
	3	11/8/2007	8	50	Steam heater tubes breakage, steam inflow from tube into intertubular space.
		Total	**120**	**10**	
KAR-30№8	1	3/20/2007	7	25	Z-604 valve failure (water level regulation in air scrubber of air cooling device)

ASUs production

		O2 Separation			O2 compression		
		2005	2006	2007	2005	2006	2007
1000 m3		1,160,986	1,414,059	1,533,093	1,160,986	1,414,059	1,533,093
Electrical Energy, kW/1000m3		765.3	710.6	708.33	112.6	111.6	113
Electrical Energy, kW		888,502,280	1,004,830,200	1,085,933,729	130,726,979	157,808,965	173,239,551
		N2 Compression			argon		
		2005	2006	2007	2005	2006	2007
1000 m3		126,996	134,125	120,661	5,000	6,470	6,470
Electrical Energy, kW/1000m3		270	327.6	338.9	270	327.6	338.9
Electrical Energy, kW		34,288,983	43,939,350	40,892,023	-	-	-

Unit BR-2 #8 production

				2006				2007			
Month	№	Plant				Total average recovery ratio reduced to 100%O_2	Specific air consumption for oxygen production (reduced to 100%O_2)			Total average recovery ratio reduced to 100%O_2	Specific air consumption for oxygen production (reduced to 100%O_2)
1		**2**				**6**	**7**			**10**	**11**
January	1	БР-2 №8				0.159446081	6.27			0.176366843	5.67
February	1	БР-2 №8				0.167491861	5.97			0.169491525	5.90
March	1	БР-2 №8				0.178428017	5.60			0.185185185	5.40
April	1	БР-2 №8				0.163664841	6.11			0.178571429	5.60
May	1	БР-2 №8				0.165467811	6.04			0.169491525	5.90
June	1	БР-2 №8				0.162462776	6.16			0.166666667	6.00
July	1	БР-2 №8				0.176156914	5.68			0.161290323	6.20
August	1	БР-2 №8				0.1696591	5.89			0.172413793	5.80
September	1	БР-2 №8				0.157910648	6.33			0.175438596	5.70
October	1	БР-2 №8				0.158300128	6.32			0.163934426	6.10
November	1	БР-2 №8				0.181303517	5.52			0.169491525	5.90
December	1	БР-2 №8				0.18632664	5.37			0.16393442	6.10

						6				6	
Ave. annual		**БР-2 №8**				**0.16891435**	**5.92**			**0.170769888**	**5.86**

Monitoring of Cosφ for all transformers during 2009.

	2009 Year to date	
Substation	Transformers	Average cos φ
KRZ 3	**KRZ-3 T-2**	**0.59**
	KRZ-3 T-3	**0.66**
KRZ 5	**KRZ-5 T-1**	**0.79**
	KRZ-5 T-2	**0.82**
	KRZ-5 T-3	**0.86**
	KRZ-5 T-4	**0.76**
	KRZ-5 T-4	**0.64**
KRZ 8	**KRZ-8 T-1**	**0.76**
	KRZ-8 T-1	**0.59**
	KRZ-8 T-2	**0.58**
	KRZ-8 T-2	**0.72**
KRZ 9	**KRZ-9 T-1**	**0.87**
	KRZ-9 T-2	**0.76**
KRZ 17	**KRZ-17 T-1**	**0.70**
	KRZ-17 T-2	**0.72**
KRZ 20	**KRZ-20 T-1**	**0.77**
	KRZ-20 T-1	**0.72**
	KRZ-20 T-2	**0.84**
	KRZ-20 T-2	**0.80**

NG BFG and COG consumptions during the last three years

	kNm3	2006	2007
HPP1 sum MP & HP	BF-gas	1,614,816	1,824,815
	CO-gas	77,112	95,984
	natural gas	28,155	16,427

HPP3	BF-gas	2,839,026	3,064,428
	CO-gas	0	0
	natural gas	38,940	25,325

Sinter shops	kNm3	2006	2007	2008
	BF-gas	83,651	83,412	69,662
	CO-gas	23,793	15,289	57,984
	natural gas	34,109	46,830	30,081

Annex 3

MONITORING PLAN

Please refer to section D of the PDD and to the Monitoring Worksheets

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<u>Annex 4</u>

<u>Letter of Endorsement</u>

УКРАЇНА
МІНІСТЕРСТВО ОХОРОНИ НАВКОЛИШНЬОГО ПРИРОДНОГО СЕРЕДОВИЩА УКРАЇНИ

03035, Київ, вул. Урицького, 35. Тел.: +(380 44) 206 3100; +(380 44)248 4933. Факс +(380 44) 2063107
E-mail: secr@menr.gov.ua

__________ № __________

Відкрите акціонерне товариство
«АрселорМіттал Кривий Ріг»

50095, Дніпропетровська обл.,
м. Кривий Ріг, вул. Орджонікідзе, 1

ЛИСТ-ПІДТРИМКИ ПРОЕКТУ СПІЛЬНОГО ВПРОВАДЖЕННЯ

«Інвестиційна програма підвищення енергоефективності на підприємстві ВАТ «АрселорМіттал Кривий Ріг»

Міністерство охорони навколишнього природного середовища України, як офіційний і уповноважений представник України, розглянуло проект «Інвестиційна програма підвищення енергоефективності на підприємстві ВАТ «АрселорМіттал Кривий Ріг» (далі – проект СВ), поданий Відкритим акціонерним товариством «АрселорМіттал Кривий Ріг», що розташоване в м. Кривий Ріг, Дніпропетровської обл., вул. Орджонікідзе, 1, надалі – Заявник, та заявляє:

1. Україна ратифікувала Кіотський протокол.

2. Для участі у діяльності відповідно до статті 6 Кіотського протоколу Україна має відповідати вимогам Рішення 11 Конференції Сторін Рамкової конвенції ООН про зміну клімату, яка водночас була Першою Зустріччю Сторін Кіотського протоколу (Монреаль, листопад 2005 року).

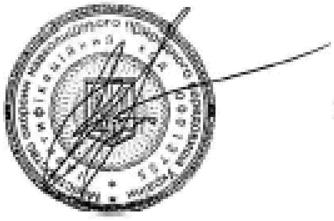
3. Міністерство охорони навколишнього природного середовища України розглянуло проект СВ та проінформоване, що Заявник має намір продати отримані одиниці скорочення викидів (ОСВ) зацікавленій компанії із зарахуванням ОСВ до реєстру країни-покупця. Міністерство охорони навколишнього природного середовища України оцінить проект СВ на відповідність українським критеріям проектів спільного впровадження та розпочне переговори із Заявником щодо розподілу отриманих ОСВ. Міністерство охорони навколишнього природного середовища України підтримує подальшу розробку проекту СВ та зобов'язується надавати, у разі потреби, необхідне сприяння у здійсненні незалежної експертизи, перевірці та передачі ОСВ.

Мінприроди
№5934/11/10-08 від 12.05.2009

4. У разі позитивної оцінки проекту СВ Міністерство охорони навколишнього природного середовища України розгляне питання щодо надання офіційного схвалення проекту СВ, що дозволить передати ОСВ на рахунок країни-покупця.

5. У разі впровадження проекту СВ до 1 січня 2008 р. та досягнення ним скорочення викидів парникових газів у період до 2008 року, Міністерство охорони навколишнього природного середовища України розгляне питання щодо передачі країні-покупцю одиниць встановленої кількості (ОВК) виключно в обсягах, створених в результаті здійснення проекту СВ до 2008 року, через механізм торгівлі викидами згідно Статті 17 Кіотського протоколу. Україна погоджується застосовувати той самий метод перевірки ОВК, який застосовується для перевірки ОСВ.

Заступник Міністра



В. Бевза

Annex 5

Environmental Impact Assessment Results and Stakeholder Consultation

a) Stakeholder consultation results for Sub-Project 1

b) Stakeholder consultation results for Sub-Project 3

c) EIA results