THIRD PERIODIC MONITORING REPORT

Version 3.0
13 August 2012

CONTENTS

ANNEXES

SECTION A. General project activity and monitoring information

A.1 Title of the project activity:

“Energy efficiency investment program at OJSC ArcelorMittal Steel Kryviy Rih”.
Sectoral scope 09: Metal Production

A.2. JI registration number:

0075
ITL Project ID: UA1000258

A.3. Short description of the project activity:

The project is aimed at increase of energy efficiency in production process and energy infrastructure at the biggest Ukrainian full cycle metallurgical plant PJSC ArcelorMittal Kryviy Rih (AMKR). The plant being one of the most up-to-date in the country metallurgy sector, however has a potential for reduction of energy consumption.

The energy efficiency assessment conducted at AMKR had identified eight key measures which are being implemented. These measures will contribute to reduction of energy consumption and importantly will lead to reduction of CO_2 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 over 100 million USD.

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[1]	47 000 000	9 250 794
4. Refurbishment of Energy Distribution System	48 000 000	9 447 619

[1] NG is natural gas, COG is coke oven gas, and BFG is blast furnace gas.

Sub project	UAH	USD(*)
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**	**102 034 285**
(*) based on exchange ratio of 0.1968 USD/UAH		

Table 1: Energy Efficiency Investment Program

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 below:

- Implementation of the project will lead to improvement of environmental climate in 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 privatization, successful restructuring and introduction of international business management practices. ERUs generation can stimulate improvements in reducing energy consumptions and improving environmental performance.

Brief information on subproject activities:

- Within the subproject 1 ”Modernization of Air Separating Unit”, the air separation unit VRU AKAr-40/35 (ВРУ АКАр-40/35) was put into operation at the end of 2011. Currently the performance of the subproject is monitored separately. If the subproject generates considerable amount of emission reductions, they will be included in the next monitoring report covering period 01/01/2012-31/12/2012.
- In the subproject 2 “Modernization of Compressors Station“ 1 compressor out of 8 intended was implemented at the end of 2008, but due to unbalanced load no emission reduction units were generated in this monitoring period. In 2011 two more compressor units have been reconstructed and started operation in the commissioning mode. Currently the performance of the subproject is monitored separately. If the subproject generates considerable amount of emission reductions, they will be included in the next monitoring report covering period 01/01/2012-31/12/2012.

- The subproject 3 has been successfully implemented and it generates emission reduction units (more detailed information is presented further)
- Within the subproject 4 “Refurbishment of Energy Distribution System” reactive power compensation equipment was installed at substations #8 and 17 of the plant at the end of 2011. Currently the performance of the subproject is monitored separately. If the subproject generates considerable amount of emission reductions, they will be included in the next monitoring report covering period 01/01/2012-31/12/2012.
- Within the subproject 5 “New Gas Burner Installation”, the boiler #2 of HPP #2 was equipped with new burners in 2008; sintering machines of the Sinter shops #1 and 2 were equipped with new burners in 2010. However due to the lack of coke gas and lower production level than anticipated in the project planning the subproject didn’t reach designed capacity.
- The subproject 6 “Turbo Generators Installation” is at the project design stage.
- Subprojects 7 and 8 are still at the consideration stage.

Thus only subproject 3 has been included in the monitoring report for the period indicated in section A.4. and has been generating emission reductions. Inclusion of only subproject 3 does not lead to changes in the monitoring plan.

Subproject #	Activity	Date
3	Fuel switch from NG to NG+COG+BFG mixture at PS #3 (Hereinafter - Rolling mill #3 or RM3)	21/05/2008
3	Fuel switch from NG to NG+COG+BFG mixture at PS 250-3 (Hereinafter - Wire rod rolling mill #3 or WRRM3)	27/05/2008
3	Fuel switch from NG to NG+COG+BFG mixture at MS 250-5 (Hereinafter - Light-section rolling mill #5 or LSRM5)	16/11/2009
3	Fuel switch from NG to NG+COG+BFG mixture at PS150-1 (Hereinafter - Wire rod rolling mill #1 or WRRM1)	31/01/2011

Table 2: History of Subproject 3 implementation

Subproject 3 description

The sub-project #3 consists of the partial replacement of natural gas used in rolling shops of the plant with gas mixture of blast furnace gas/coke oven gas/natural gas (BFG+COG+NG) by replacing burners, installing and connecting system of gas mixing and installing boosting stations.

The heat content associated with the use of waste gases that otherwise would be lost through combustion in a flare is equal to the heat content of the equivalent amount of natural gas that would be used in the baseline. Replacement of NG by COG+BFG+NG mixture for the heating of reheating furnaces of rolling mill#3 (RM3), wire rod rolling mill #3 (WRRM3), and light-section rolling mill #5 (LSRM5) has been implemented during 2008-2009; replacement at wire rod rolling mill #1 (WRRM1) has been implemented in 2011. Currently gas mixture of COG, BFG and NG together with direct NG consumption is being used instead of NG only. The flow diagrams shown in Fig. 2, and 3 (see Annex 2) describe natural gas and mixture flow as well as gas metering points at the modernized rolling mills before and after the project implementation.

As a result of SP3 implementation, RM3, WRRM3, WRRM1 and LSRM5 have significantly (approximately two times) reduced consumption of NG. This amount of NG has been replaced by a large amount of COG and BFG that ia utilized instead of being flared.

A.4. Monitoring period:

- Monitoring period starting date: 01/01/2011 at 00:00;
- Monitoring period closing date: 31/12/2011 at 24:00

A.5. Methodology applied to the project activity (incl. version number):

A.5.1. Baseline methodology:

The JI specific approach regarding baseline setting and monitoring has been developed for the subprojects in accordance with Appendix B of the JI Guidelines[2] and with the JISC Guidance on Criteria for Baseline Setting and Monitoring[3].

<u>Subproject 3: Switch from NG to BFG+COG+NG mixture</u>

According to the approach selected, the actual fuel demand of RM3, WRRM1, WRRM3 and LSRM5 in the baseline scenario is covered by natural gas only. Fuel demand in the baseline is taken equal to the actual demand in project scenario, in which it is being covered by BFG+COG+NG mixture and direct NG consumption. Monitoring of actual consumption of NG and gas mixture, shares of individual gases in the mixture and their actual NCVs allows for accurate and transparent calculation of the baseline emissions.

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[2] http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=2

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

A.5.2. Monitoring methodology:

Subproject 3: Switch from NG to BFG+COG+NG mixture

Usage of COG and BFG in project scenario does not generate emissions as these gases otherwise would have been flared. Their usage substitutes the respective amount of NG. In the baseline all demand is covered by NG only.

Therefore, the following parameters are to be monitored:

- The full NG consumption of RM3, WRRM1, WRRM3 and LSRM5 which includes direct NG consumption (metered at gas reducing stations) and NG consumed as a part of BFG+COG+NG mixture (calculated based on metered data))[4];
- Gas mix consumptions (metered at the entrances of RM3, WRRM1, WRRM3 and LSRM5);
- NCV of NG (monitored based on NG certificates regularly provided by the NG supplier);
- Amount of BFG entering the CGMS;
- Amount of COG entering the CGMS;
- Amount of NG entering the CGMS.
- NCV of COG and BFG.
  The NCV of gas mix and the share of NG in the gas mix are calculated based on volume and NCV of NG, CG and BFG in the gas mix measured at the central gas mixing station (CGMS).

Assumptions:

- The technical lifetime of the existing and installed equipment can last at least to the end of the crediting period;
- Heat demands of RM3, WRRM1, WRRM3 and LSRM5 in the baseline are equal to those of the project scenario;
- Without the proposed project the heat demands of RM3, WRRM1, WRRM3 and LSRM5 would be covered by combustion of NG only;
- The IPCC default carbon dioxide emission factor of NG combustion is used.

The resulting emissions in the baseline and project scenarios will then be calculated using the IPCC default carbon dioxide emission factor for NG combustion.

[4] All gas volumes presented in the monitoring report are provided at standard conditions of temperature and pressure which are 20ºC and 101 325 Pa.

Next tables include parameters that are applied for calculation of baseline and project scenario emissions.

Parameters related to gases entering central gas mixing station (CGMS), SP3

ID	Description	Data variable	Data unit	Measured (m) Calculated (c) Estimated (e)	Proportion of data to be monitored	Data recording	Archived data	Comment
1.	BFG consumption at CGMS in year y	$\mathbf{BFG_{CGMS,y}}$	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
2.	COG consumption at CGMS in year y	$\mathbf{COG_{CGMS,y}}$	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
3.	NG consumption at CGMS in year y	$\mathbf{NG_{CGMS,y}}$	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
4.	NCV of BFG in year y	$\mathbf{NCV_{BFG,y}}$	kcal/ m^3	e	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
5.	NCV of COG in year y	$\mathbf{NCV_{COG,y}}$	kcal/ m^3	e	100%	Electronic and paper	At least two years after last Carbon Credit delivery	

6.	NCV of NG in year y	**$NCV_{NG,y}$**	kcal/ m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
7.	NCV of gas mix in year y	**$NCV_{MIX,SP3,PS,y}$**	kcal/ m^3	c	100%	Electronic and paper	At least two years after last Carbon Credit delivery	

Table 3: Parameters related to gases entering central gas mixing station SP3/CGMS

Parameters related to baseline emissions calculation of RM3, SP3

ID	Description	Data variable	Data unit	Measured (m) Calculated (c) Estimated (e)	Proportion of data to be monitored	Data recording	Archived data	Comment
8.	Baseline GHG emissions of RM3 in year y	**$BE_{SP3,RM3,y}$**	tCO_2e	c	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
9.	Baseline NG consumption by RM3	**$NG_{SP3,BS,RM3,y}$**	1000 m^3	c	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
10.	Direct NG consumption by RM3 in year y	**$NG_{Dir,SP3,PS,RM3,y}$**	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	

11.	Mixture of BFG, COG and NG consumption by RM3 in year y	$\mathbf{MIX}_{SP3,PS,RM3,y}$	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	

Table 4: Parameters related to baseline emissions of SP3/RM3

Parameters related to baseline emissions calculation of WRRM3, SP3

ID	Description	Data variable	Data unit	Measured (m) Calculated (c) Estimated (e)	Proportion of data to be monitored	Data recording	Archived data	Comment
12.	Baseline GHG emissions of WRRM3 in year y	$\mathbf{BE}_{SP3,WRRM3,y}$	tCO_2e	c	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
13	Baseline NG consumption by WRRM3	$\mathbf{NG}_{SP3,BS,WRRM3,y}$	1000 m^3	c	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
14.	Direct NG consumption by WRRM3 in year y	$\mathbf{NG}_{Dir,SP3,PS,WRRM3,y}$	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	

15.	Mixture of BFG, COG and NG consumption by WRRM3 in year y	$\mathbf{MIX}_{SP3,PS,WRRM3,y}$	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	

Table 5: Parameters related to baseline emissions of SP3/WRRM3

Parameters related to baseline emissions calculation of LSRM5, SP3

ID	Description	Data variable	Data unit	Measured (m) Calculated (c) Estimated (e)	Proportion of data to be monitored	Data recording	Archived data	Comment
16.	Baseline GHG emissions of LSRM5 in year y	$\mathbf{BE}_{SP3,LSRM5,y}$	tCO_2e	c	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
17.	Baseline NG consumption by LSRM5	$\mathbf{NG}_{SP3,BS,LSRM5,y}$	1000 m^3	c	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
18.	Direct NG consumption by LSRM5 in year y	$\mathbf{NG}_{Dir,SP3,PS,LSRM5,y}$	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	

19.	Mixture of BFG, COG and NG consumption by LSRM5 in year y	$\mathbf{MIX}_{SP3,PS,LSRM5,y}$	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	

Table 6: Parameters related to baseline emissions of SP3/LSRM5

Parameters related to baseline emissions calculation of WRRM1 , SP3

ID	Description	Data variable	Data unit	Measured (m) Calculated (c) Estimated (e)	Proportion of data to be monitored	Data recording	Archived data	Comment
20.	Baseline GHG emissions of WRRM1 in year y	$\mathbf{BE}_{SP3,WRRM1,y}$	tCO_2e	c	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
21.	Baseline NG consumption by WRRM1	$\mathbf{NG}_{SP3,BS,WRRM1,y}$	1000 m^3	c	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
22.	Direct NG consumption by WRRM1 in year y	$\mathbf{NG}_{Dir,SP3,PS,WRRM1,y}$	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	

23.	Mixture of BFG, COG and NG consumption by WRRM1 in year y	$\mathbf{MIX}_{SP3,PS,WRRM1,y}$	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	

Table 7: Parameters related to baseline emissions of SP3/WRRM1

The project emissions of SP3 will be calculated through monitoring of direct and indirect NG consumption, and share of NG+CG+BFG mix consumed.

Parameters related to project emissions calculation of RM3, SP3

ID	Description	Data variable	Data unit	Measured (m) Calculated (c) Estimated (e)	Proportion of data to be monitored	Data recording	Archived data	Comment
24.	Project GHG emissions of RM3 in year y	$\mathbf{PE}_{SP3,RM3,y}$,	tCO_2e	c	100%	Electronic and paper	Two years after last Carbon Credit delivery	
25.	Total NG consumption by RM3 in year y	$\mathbf{NG}_{SP3,PS,RM3,y}$	1000 m^3	c	100%	Electronic and paper	Two years after last Carbon Credit delivery	
26.	RM3 NG consumption from gas mix in year y	$\mathbf{NG}_{MIX,SP3,PS,y}$	1000 m^3	c	100%	Electronic and paper	At least two years after last Carbon Credit delivery	

27.	RM3 gas mix consumption in year y	**$MIX_{SP3,PS,RM3,y}$**	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
28.	Direct NG consumption by RM3 in year y	**$NG_{Dir,SP3,PS,RM3,y}$**	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
29.	Volumetric share of NG in gas mix in year y	**$\%NG_{MIX,SP3,PS,y}$**	*dimensionless*	*c*	*100%*	Electronic and paper	Two years after last Carbon Credit delivery	

Table 8: Parameters related to project emissions of SP3/RM3

Parameters related to project emissions calculation of WRRM3, SP3

ID	Description	Data variable	Data unit	Measured (m) Calculated (c) Estimated (e)	Proportion of data to be monitored	Data recording	Archived data	Comment
30.	Project emissions of WRRM3 in year y	**$PE_{SP3,WRRM3,y}$,**	tCO_2e	c	100%	Electronic and paper	Two years after last Carbon Credit delivery	
31.	Total NG consumption by WRRM3 in year y	**$NG_{SP3,PS,WRRM3,y}$**	1000 m^3	c	100%	Electronic and paper	Two years after last Carbon Credit delivery	

32.	WRRM3 NG consumption from gas mix in year y	$NG_{MIX,SP3,PS,WRRM3,y}$	1000 m^3	c	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
33.	WRRM3 gas mix consumption in year y	$MIX_{SP3,PS,WRRM3,y}$	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
34.	Direct NG consumption by WRRM3 in year y	$NG_{Dir,SP3,PS,WRRM3,y}$	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	

Table 9: Parameters related to project emissions of SP3/WRRM3

Parameters related to project emissions calculation of LSRM5, SP3

ID	Description	Data variable	Data unit	Measured (m) Calculated (c) Estimated (e)	Proportion of data to be monitored	Data recording	Archived data	Comment
35.	Project emissions of LSRM5 in year y	$PE_{SP3,\ LSRM5,y}$,	tCO_2e	c	100%	Electronic and paper	Two years after last Carbon Credit delivery	
36.	Total NG consumption by LSRM5 in year y	$NG_{SP3,PS,LSRM5,y}$	1000 m^3	c	100%	Electronic and paper	Two years after last Carbon Credit delivery	

37.	LSRM5 NG consumption from gas mix in year y	**NG**$_{MIX,SP3,PS,LSRM5,y}$	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
38.	LSRM5 gas mix consumption in year y	**MIX** $_{SP3,PS,LSRM5,y}$	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
39.	Direct NG consumption by LSRM5 in year y	**NG**$_{Dir,SP3,PS,LSRM5,y}$	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	

Table 10: Parameters related to project emissions of SP3/LSRM5

Parameters related to project emissions calculation of WRRM1, SP3

ID	Description	Data variable	Data unit	Measured (m) Calculated (c) Estimated (e)	Proportion of data to be monitored	Data recording	Archived data	Comment
40.	Project emissions of WRRM1 in year y	**PE**$_{SP3,WRRM1,y}$	tCO_2e	c	100%	Electronic and paper	Two years after last Carbon Credit delivery	
41.	Total NG consumption by WRRM1 in year y	**NG**$_{SP3,PS,WRRM1,y}$	1000 m^3	c	100%	Electronic and paper	Two years after last Carbon Credit delivery	

42.	WRRM1 NG consumption from gas mix in year y	$NG_{MIX,SP3,PS,WRRM1,y}$	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
43.	WRRM1 gas mix consumption in year y	$MIX_{SP3,PS,WRRM1,y}$	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	
44.	Direct NG consumption by WRRM1 in year y	$NG_{Dir,SP3,PS,WRRM1,y}$	1000 m^3	m	100%	Electronic and paper	At least two years after last Carbon Credit delivery	

Table 11: Parameters related to project emissions of SP3/WRRM1

A.6. Status of implementation including time table for major project parts:

Letters of Approval were issued by both parties:
Letter of Approval from NEIA of Ukraine #1522/23/7 from 05/10/2010
Letter of Approval from Luxembourg Departement de l'environnement #1 from 28/05/2010
Letters of Approval are available at:
http://ji.unfccc.int/JIITLProject/DB/JQ756K3VCDKV3E8T8G4GGFNP4C4IDC/details

In more detail status of the project implementation is described in Section A.3.

A.7. Intended deviations or revisions to the registered PDD:

During the current monitoring period (01/2011-12/2011), the Subproject 3 has been expanded:

- One more rolling mill (WRRM1) was switched on consumption of natural, blast furnace and coke gas mix.

The justification of Subproject 3 expansion through switching rolling mills on consumption of natural, blast furnace and coke gas mix has been stated in Annex 2 according to the procedures regarding changes during project implementation[5].

[5] http://ji.unfccc.int/Sup_Committee/Meetings/022/Reports/Annex2.pdf

Monitored amount of emissions reduction differs from the one expected in PDD for the respective period stated in A.4. as shown in the table below:

Year	2011
ER in MR003 (01/01/2011-31/12/2011) in tonnes of CO_2 equiv.	138 833
ER in the determined PDD for the period 01/01/2011-31/12/2011 in tonnes of CO_2 equiv.	580 911

Table 12: Monitored amount of ER and expected in PDD for 2011

ERU amount calculated in PDD version 04 from 04/08/2009 was an estimated value, which was assessed based on an assumption that the plant would implement all subprojects without any delay. However due to the difficult economic situation in Ukraine, instability at world metal market and other significant reasons, the project implementation schedule has been shifted (for more detail please see Section A.3.). All above mentioned caused reduction in actually generated emission reductions versus those in the determined PDD.

A.8. Intended deviations or revisions to the registered monitoring plan

One more rolling mill (WRRM1) has been switched on consumption of natural, blast furnace and coke gas mix and included in the emission reduction project. Thereby the monitoring plan has been correspondingly updated in order to include monitoring of WRRM1 operation and ensure accurate monitoring of emission reductions generated under the project:

- The Table 7 describing parameters relating to the baseline emissions of WRRM1 has been added.
- The Table 11 describing parameters relating to the project emissions of WRRM1 has been added.
- Tables 21, 22 and 23 have been amended with the following parameters:
    - Amount of natural gas consumed by WRRM1 directly (represented as parameter $\mathbf{NG_{Dir,SP3,PS,WRRM1,y}}$)
    - Amount of natural gas consumed by WRRM1 as a part of gas mix (represented as parameter $\mathbf{NG_{MIX,P3,PS,WRRM1,y}}$)
    - Total amount of natural gas consumed by WRRM1 (represented as parameter $\mathbf{NG_{SP3,PS,WRRM1,y}}$)
    - Amount of gas mix consumed by WRRM1 (represented as parameter $\mathbf{MIX_{SP3,PS,WRRM1,y}}$)
    - Baseline amount of natural gas consumed by WRRM1 (represented as parameter $\mathbf{NG_{SP3,BS,WRRM1,y}}$)
- The Table 18 describing measurement equipment used for monitoring of natural gas and gas mix consumption by WRRM1 has been added
- Information on procedure of collection and processing of data concerning WRRM1 operation has been collected from the plant

In order to calculate emission reductions the existing formulae have been applied; the WRRM1 has been added to the list of monitored rolling mills (under the symbol *i*).

Additionally, in order to increase calculation accuracy by applying the approved IPCC conversion factor from calorie into Joule (4.1868[6] instead of 4.187) the following formulae have been revised:

Equation ID	Equation in the registered MP	Equation in the revised MP
2	$PE_{SP3,i,y} = NG_{SP3,PS,i,y} \times NCV_{NG,y} \times EF_{NG} \times 4.187 \div 1000$	$PE_{SP3,i,y} = NG_{SP3,PS,i,y} \times NCV_{NG,y} \times EF_{NG} \times 4.1868 \div 1000$
8	$BE_{SP3,i,y} = NG_{SP3,BS,i,y} \times NCV_{NG,y} \times EF_{NG} \times 4.187 \div 1000$	$BE_{SP3,i,y} = NG_{SP3,BS,i,y} \times NCV_{NG,y} \times EF_{NG} \times 4.1868 \div 1000$

Table 13: Formulae deviations to the registered MP

In order to fix inaccuracy, data units of NG and gas mix consumptions have been changed from m^3 into 1000 m^3 in Tables 3-11 of the monitoring report.

A.9. Changes since the last verification:

Subproject #3 “Switch from NG to BFG+COG+NG mixture” has been expanded. Wire rod rolling mill #1 (WRRM1) has been switched to BFG+COG+NG mix consumption on 31/01/2011 and added to the project. The monitoring report has been correspondingly amended to reflect the subproject extension (for more detail please see Section A.8. and Annex 2).

Measurement equipment within the project boundaries has been partially changed due to modernization of Central gas mixing station (CGMS) monitoring system and other technological needs. Additionally, some inaccuracies have been corrected.
Table 14 contains completely new set of equipment used for monitoring of CGMS parameters. The commissioning works on new measurement complex were finished on 21 December 2010, the monitoring using the new measurement complex started on 1 January 2011. At RM3 temperature sensors TSM 1088 have been replaced by TSP 0879 (See Table 15). At LSRM#5 all recording procedures are performed by controllers TREI 5b M801E instead of devices BRU-10 (See Table 16). At WRRM#3 flow recorder of natural gas at furnace 1 has been corrected: Disc-250M #2973 instead of BRU-10 #2973 is used (See Table 17). The pressure measurement units have been corrected from kg/cm^2 into kgf/m^2, kgf/cm^2 and kPa (See Tables 15-17).

[6] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/1_Volume1/V1_8x_Ch8_An1_Units_Index.pdf

A.10. Person(s) responsible for the preparation, submission and approval of the monitoring report:

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- Alex Churilov, Manager for Engineering and Construction Projects

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- Denis Prusakov, JI Team leader
- Petruk Iurii, JI Consultant

SECTION B. Key monitoring activities

Subproject 3: Switch from NG to BFG+COG+NG mixture

Key monitoring activities for SP3 include:

- monitoring of actual composition of BFG+COG+NG gas mixture in order to calculate NCV of mixture and share of NG in it;
- monitoring of gas mixture consumption of RM3, WRRM1, WRRM3 and LSRM5;
- monitoring of direct NG consumption of RM3, WRRM1, WRRM3 and LSRM5.

B.1. Monitoring equipment:

Subproject 3: Switch from NG to BFG+COG+NG mixture

Consumption of gases at rolling mills as well as volume of gases entering the CGMS is metered in the following way: every metering point is equipped with flow sensor with recorder, logging the daily consumption in form of a circular diagram, linear diagram or electronic memory. Similar to the flow metering, the pressure and temperature of gases are metered and recorded. The diagrams and electronic records are processed on a daily basis in the planimetric group belonging to the service for service for automation of technological processes of AMKR. The obtained daily consumptions are logged and reported to the energy department. This allows continuous monitoring and logging of 100% data of consumption of NG, COG, BFG and gas mix at CGMS and the rolling mills. The meters, which were used for monitoring of the project parameters, were kept in the valid conditions (checked, calibrated, there were no gap between the calibrations etc.) within the considered monitoring period.

B.1.2. Tables providing information on the equipment used (incl. manufacturer, type, serial number, date of installation, date of last calibration, accuracy):

Parameter, location	Measurement abbreviation	Manufacturer/ type	Serial number	Unit	Installation date	Accuracy	Last calibration	Next calibration	Comments
Individual gases entering the CGMS[7]									
NG consumption. CGMS #2 control room	**MNG_{CGMS}**	Flow recorder: Schneider Multitrend M-340	9041400001	m^3	12/2010	±0.025 %	05/2011	05/2013	The commissioning works on new measurement complex were finished on 21 December 2010, the monitoring using the new measurement complex started on 1 January 2011. Therefore completely different set of equipment is used for monitoring in 2011 comparing to
		Flow sensor: STD924	33522005007	m^3	12/2010	±0.025 %	02/2012	02/2014	
		Pressure recorder: Schneider Multitrend M-340	9041400001	kPa	12/2010	±0.025 %	05/2011	05/2013	
		Pressure sensor: Sapfir22	209408	kPa	12/2010	±0.25 %	05/2012	05/2013	
		Temperature recorder: Schneider Multitrend M-340	9041400001	°C	12/2010	±0.025 %	05/2011	05/2013	
		Temperature sensor: TSM 1088	147L90	°C	12/2010	± 1.0 %	05/2012	05/2014	
		Flow recorder: Schneider Multitrend M-340	9041500001	m^3	12/2010	±0.025 %	05/2011	05/2013	
		Flow sensor: STD924	2549007001	m^3	12/2010	±0.025 %	06/2011	06/2013	

[7] RM3, WRRM1, WRRM3 and LSRM5 consume COG/BFG/NG mix prepared at CGMS. To obtain the NCV of mix and share of NG in it, the data of CGMS are included in MR.

		Pressure recorder: Schneider Multitrend M-340	9041500001	kPa	12/2010	±0.025 %	05/2011	05/2013	those of the previous period.
		Pressure sensor: STG924	0161001001	kPa	12/2010	±0.25 %	06/2011	06/2013	
		Temperature recorder: Schneider Multitrend M-340	9041400001	°C	12/2010	±0.025 %	05/2011	05/2013	
		Temperature sensor: TSMU 0289	036	°C	12/2010	± 1.0 %	05/2012	05/2014	
COG consumption. CGMS#2 control room	**$MCOG_{CGMS}$**	Flow recorder: Schneider Multitrend M-340	9041400001	m^3	12/2010	±0.025 %	05/2011	05/2013	The commissioning works on new measurement complex were finished on 21 December 2010, the monitoring using the new measurement complex started on 1 January 2011. Therefore completely different set of equipment is used for monitoring in 2011 comparing to those of the previous period.
		Flow sensor: ARG	282	m^3	12/2010	± 1.0 %	09/2010	09/2012	
		Pressure recorder: Schneider Multitrend M-340	9041400001	m^3	12/2010	±0.025 %	05/2011	05/2013	
		Pressure sensor: STG 94L	6819009003	kPa	12/2010	±0.25 %	06/2011	06/2013	
		Temperature recorder: Schneider Multitrend M-340	9041400001	m^3	12/2010	±0.025 %	05/2011	05/2013	
		Temperature sensor: TSM 1088	147L91	°C	12/2010	± 1.0 %	05/2012	05/2014	
		Flow recorder: Schneider Multitrend M-340	9041500001	m^3	12/2010	±0.025 %	05/2011	05/2013	
		Flow sensor: ARG	281	m^3	12/2010	±0.25 %	09/2010	09/2012	
		Pressure recorder: Schneider Multitrend M-340	9041500001	m^3	12/2010	±0.025 %	05/2011	05/2013	
		Pressure sensor: STG 94L	6819009001	kPa	12/2010	±0.25 %	06/2011	06/2013	

		Temperature recorder: Schneider Multitrend M-340	9041500001	m^3	12/2010	±0.025 %	05/2011	05/2013	
		Temperature sensor: TSMU 0289	028	°C	12/2010	± 1.0 %	05/2012	05/2014	
		Flow recorder: Schneider Multitrend M-340	9041400001	m^3	12/2010	±0.025 %	05/2011	05/2013	The commissioning works on new measurement complex were finished on 21 December 2010, the monitoring using the new measurement complex started on 1 January 2011. Therefore completely different set of equipment is used for monitoring in 2011 comparing to those of the previous period.
		Flow sensor: ARG	280	m^3	12/2010	±0.25 %	09/2010	09/2012	
		Pressure recorder: Schneider Multitrend M-340	9041400001	m^3	12/2010	±0.025 %	05/2011	05/2013	
		Pressure sensor: STG 94L	6819009002	kPa	12/2010	±0.25 %	06/2011	06/2013	
		Temperature recorder: Schneider Multitrend M-340	9041400001	m^3	12/2010	±0.025 %	05/2011	05/2013	
BFG consumption. CGMS#2 control room	**$MBFG_{CGMS}$**	Temperature sensor: TSM 1088	147L92	°C	12/2010	± 1.0 %	05/2012	05/2012	
		Flow recorder: Schneider Multitrend M-340	9041500001	m^3	12/2010	±0.025 %	05/2011	05/2013	
		Flow sensor: ARG	279	m^3	12/2010	± 1.0 %	09/2010	09/2012	
		Pressure recorder: Schneider Multitrend M-340	9041500001	m^3	12/2010	±0.025 %	05/2011	05/2013	
		Pressure sensor: STG 94L	6819009013	kPa	12/2010	± 1.5 %	06/2011	06/2013	
		Temperature recorder: Schneider Multitrend M-340	9041500001	m^3	12/2010	±0.025 %	05/2011	05/2013	

		Temperature sensor: TSMU 0289	030	°C	12/2010	± 1.0 %	05/2012	05/2014	

Table 14: Devices used for measurement at CGMS

Parameter, location	Measurement abbreviation	Manufacturer/ type	Serial number	Unit	Installation date	Accuracy	Last calibration	Next calibration	Comments
Consumption of gases by RM3									
Direct NG consumption by RM3. Gas reducing station of RM3	$MNG_{Dir,RM3}$	Flow recorder: DR4311	1741000029	m^3	05/2008	± 1 %	12/2011	12/2012	
		Flow sensor: Rosemaunt	7962954	m^3	08/2010	± 0.015 %	12/2011	12/2012	
		Pressure recorder: DR4311	1741000043	kgf/m^2	05/2008	± 1 %	12/2011	12/2012	
		Pressure sensor: STD924	1499001024	kgf/m^2	05/2008	± 1 %	12/2011	12/2012	
		Temperature recorder: DR4300	3253000003	ºC	05/2008	± 1 %	04/2012	04/2013	
		Temperature sensor: TSP 0879	425-33	ºC	2011	± 1 %	04/2012	04/2014	Sensor T SP 0879 was used instead of TSM 1088
COG+BFG+NG mix consumption by RM3. Gas reducing station of RM3	$MMIX_{RM3}$	Flow recorder: DR4311	1741000027	m^3	05/2008	± 1 %	12/2011	12/2012	
		Flow sensor: Metran	326612	m^3	05/2008	± 1 %	12/2011	12/2012	
		Pressure recorder: DR4311	1741000051	kgf/m^2	05/2008	± 1 %	12/2011	12/2012	

		Pressure sensor: STD924	1499001026	kgf/ m^2	05/2008	± 1 %	12/2011	12/2012	
		Temperature recorder: DR4311	1741000048	ºC	05/2008	± 1 %	12/2011	12/2012	
		Temperature sensor: TSP 0879	425-51	ºC	2011	± 1 %	04/2012	04/2014	Sensor T SP 0879 was used instead of TSM 1088

Table 15: Devices used for measurement at RM3

Parameter, location	Measurement abbreviation	Manufacturer/ type	Serial number	Unit	Installation date	Accuracy	Last calibration	Next calibration	Comments
Consumption of gases by LSRM5									
Direct NG consumption by LSRM5. Gas reducing station of LSRM5	$MNG_{Dir,LSRM5}$	Furnace 1. Flow recorder: TREI 5b M801E	C400586	m^3	11/2009	± 0.5 %	05/2011	05/2012	Controller TREI 5b M801E is used instead of BRU-10
		Furnace 1. Flow sensor: ARG-31.2	253	m^3	11/2009	± 1 %	09/2011	09/2013	
		Furnace 1. Pressure recorder: TREI 5b M801E	C400586	kPa	11/2009	± 0.5 %	05/2011	05/2012	Controller TREI 5b M801E is used instead of BRU-10
		Furnace 1. Pressure sensor: AIR-20/M2	20-31194	kPa	11/2009	± 0.5 %	05/2011	05/2013	Serial number of the meter has been corrected
		Temperature recorder: TREI 5b M801E	C400586	ºC	11/2009	± 0.5 %	05/2011	05/2012	Complex temperature

		Temperature sensor: TSM 1088	C400586	ºC	11/2009	± 1 %	04/2012	04/2014	measurement for both furnaces
		Furnace 2. Flow recorder: TREI 5b M801E	C400587	m^3	11/2009	± 0.5 %	05/2011	05/2012	Controller TREI 5b M801E is used instead of BRU-10
		Furnace 2. Flow sensor: ARG-31.2	254	m^3	11/2009	± 1 %	09/2011	09/2013	
		Furnace 2. Pressure recorder: TREI 5b M801E	C400587	kPa	11/2009	± 0.5 %	05/2011	05/2012	Controller TREI 5b M801E is used instead of BRU-10
		Furnace 2. Pressure sensor: AIR-20/M2	20-36134	kPa	11/2009	± 0.5 %	05/2011	05/2013	
COG+BFG+NG mix consumption by LSRM5. Gas reducing station of LSRM5	**$MMIX_{LSRM5}$**	Furnace 1. Flow recorder: TREI 5b M801E	C400586	m^3	11/2009	± 0.5 %	05/2011	05/2012	Controller TREI 5b M801E is used instead of BRU-10
		Furnace 1. Flow sensor: ARG-31.2	249	m^3	11/2009	± 1 %	08/2011	08/2013	
		Furnace 1. Pressure recorder: TREI 5b M801E	C400586	kPa	11/2009	± 0.5 %	05/2011	05/2012	Controller TREI 5b M801E is used instead of BRU-10
		Furnace 1. Pressure sensor: AIR-20/M2	20-31195	kPa	11/2009	± 0.5 %	05/2011	05/2012	
		Temperature recorder: TREI 5b M801E	C400586	ºC	11/2009	± 0.5 %	05/2011	05/2012	Complex temperature measurement for both furnaces
		Temperature sensor: TSM 1088	026	ºC	11/2009	± 1 %	04/2012	04/2014	

		Furnace 2. Flow recorder: TREI 5b M801E	C400587	m^3	11/2009	± 0.5 %	05/2011	05/2012	Controller TREI 5b M801E is used instead of BRU-10
		Furnace 2. Flow sensor: ARG-31.2	250	m^3	11/2009	± 1 %	09/2011	09/2013	
		Furnace 2. Pressure recorder: TREI 5b M801E	C400587	kPa	11/2009	± 0.5 %	05/2011	05/2012	Controller TREI 5b M801E is used instead of BRU-10
		Furnace 2. Pressure sensor: AIR-20/M2	20-36135	kPa	11/2009	± 0.5 %	05/2011	05/2012	

Table 16: Devices used for measurement at LSRM5

Parameter, location	**Meter abbreviation**	**Manufacturer/ type**	**Serial number**	**Unit**	**Installation date**	**Accuracy**	**Last calibration**	**Next calibration**	**Comments**
Consumption of gases by WRRM3									
Direct NG consumption by WRRM3 Gas reducing station of WRRM3	$MNG_{Dir,WRRM3}$	Furnace 1. Flow recorder: Disc-250M	2305	m^3	07/2008	± 1 %	09/2011	09/2012	
		Furnace 1. Flow sensor: ARG-31.2	207	m^3	07/2008	± 1 %	08/2011	08/2013	
		Furnace 2. Flow recorder: Disc-250M	2973	m^3	07/2008	± 1 %	09/2011	09/2012	The meter has been corrected from BRU-10 into Disc-250M
		Furnace 2. Flow sensor: ARG-31.2	208	m^3	07/2008	± 1 %	08/2011	08/2013	
		Furnace 1. Pressure recorder: Disc-250M	3017	kgf/cm^2	07/2008	± 1 %	09/2011	09/2012	

		Furnace 1. Pressure sensor: Metran-100	378762	kgf /m²	07/2008	± 0.5 %	09/2011	09/2012	
		Furnace 2. Pressure recorder: Disc-250M	2308	kgf /m²	07/2008	± 1 %	09/2011	09/2012	
		Furnace 2. Pressure sensor: Metran-100	376746	kgf /m²	07/2008	± 0.5 %	09/2011	09/2012	
		Temperature recorder: Disc-250M	2309	ºC	07/2008	± 1 %	03/2012	03/2013	Complex temperature measurement for both furnaces
		Temperature sensor: TSM 1088	082L75	ºC	07/2008	± 1 %	04/2012	04/2014	
COG+BFG+NG mix consumption by WRRM3. Gas reducing station of WRRM3	**MMIX** $_{WRRM3}$	Furnace 1. Flow recorder: DR4311	1741000028	m³	07/2008	± 1 %	09/2011	09/2012	
		Furnace 1. Flow sensor: ARG-31.2	205	m³	07/2008	± 1 %	08/2011	08/2013	
		Furnace 2. Flow recorder: DR4311	2038900020	m³	07/2008	± 1 %	09/2011	09/2012	
		Furnace 2. Flow sensor: ARG-31.2	206	m³	07/2008	± 1 %	08/2011	08/2013	
		Furnace 1. Pressure recorder: DR4311	3253000002	kgf /m²	07/2008	± 1 %	09/2011	09/2012	
		Furnace 1. Pressure sensor: STD924	1499005002	kgf /m²	07/2008	± 1 %	09/2011	09/2012	
		Furnace 2. Pressure recorder: DR4311	1741000047	kgf /m²	07/2008	± 1 %	09/2011	09/2012	
		Furnace 2. Pressure sensor: STD924	1499005014	kgf /m²	07/2008	± 1 %	09/2011	09/2012	
		Temperature recorder: Disc-250M	3139	ºC	07/2008	± 1 %	03/2011	03/2012	Complex temperature

		Temperature sensor: TSM 1088	082L76	ºC	07/2008	± 1 %	04/2012	04/2014	measurement for both furnaces

Table 17: Devices used for measurement at WRRM3

Parameter, location	Meter abbreviation	Manufacturer/ type	Serial number	Unit	Installation date	Accuracy	Last calibration	Next calibration	Comments
Consumption of gases by WRRM1									
Direct NG consumption by WRRM1. Gas reducing station of WRRM1	**$MNG_{Dir,WRRM1}$**	Flow recorder: SIEMENS S7 400	SVPV1399945	m^3	01/2011	± 0.5 %	05/2012	05/2013	
		Flow sensor: ARG-31.2	270	m^3	01/2011	± 1 %	10/2010	10/2012	
		Flow recorder: SIEMENS S7 400	SVPV1399945	m^3	01/2011	± 0.5 %	05/2012	05/2013	
		Pressure sensor: AIR-20/M2	20-36652	kgf/cm^2	01/2011	± 0.5 %	05/2012	05/2014	
		Flow recorder: SIEMENS S7 400	SVPV1399945	m^3	01/2011	± 0.5 %	05/2012	05/2013	
		Temperature sensor: TSM 1088	022	ºC	01/2011	± 0.5 %	04/2012	04/2014	
COG+BFG+NG mix consumption by WRRM1. Gas reducing station of WRRM1	**$MMIX_{WRRM1}$**	Flow recorder: SIEMENS S7 400	SVPV1399945	m^3	01/2011	± 0.5 %	05/2012	05/2013	
		Flow sensor: ARG-31.2	283	m^3	01/2011	± 1 %	10/2010	10/2012	
		Flow recorder: SIEMENS S7 400	SVPV1399945	m^3	01/2011	± 0.5 %	05/2012	05/2013	

		Pressure sensor: AIR-20/M2	20-77710	kgf/ cm^2	01/2011	± 0.5 %	05/2012	05/2014	
		Flow recorder: SIEMENS S7 400	SVPV1399945	m^3	01/2011	± 0.5 %	05/2012	05/2013	
		Temperature sensor: TSM 1088	023	ºC	01/2011	± 0.5 %	04/2012	04/2014	

Table 18: Devices used for measurement at WRRM1

B.1.3. Calibration procedures:

Calibration of measurement equipment:

QA/QC procedures		Bodies responsible for calibration and certification
Calibration interval of the following measurement equipment is 1 year: • Sapfir22 • DR4311 (flow and pressure) • Rosemaunt • STD924 (pressure) • DR4300 • Metran • TREI 5b M801E • Disc-250M • Metran-100 • SIEMENS S7 400	Calibration interval of the following measurement equipment is 2 years: • Schneider Multitrend M-340 • STD924 (flow) • TSM 1088 • STG924 • TSMU 0289 • ARG • STG 94L • TSP 0879 • DR4311 (temperature) • ARG-31.2 • AIR-20/M2	Instrumental service of the plant; SE “Dneprstandartmetrology”

Table 19: QA/QC procedures for calibration of equipment

B.1.4. Involvement of Third Parties:

State Dnepropetrovsk regional center for standardization, metrology and certification (SE “Dneprstandartmetrology”)

Kryviy Rih transmission department of Ukrtransgas (gas transmission company, a part of NAK Naftogas) is the natural gas supplier of AMKR. It regularly provides gas certificates containing data on NCV NG to AMKR.

B.2. Data collection (accumulated data for the whole monitoring period):

Subproject 3: Switch from NG to BFG+COG+NG mixture

Data variable	Source of data	Data unit	Value
EF_{NG} carbon dioxide emission factor for natural gas combustion	*Default factor, 2006 IPCC Guidelines , http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html, V.2-Energy, Table 1.4*	tCO_2e/GJ	0.0561

Table 20: Fixed default values for SP3

B.2.2. List of variables:

Subproject 3: Switch from NG to BFG+COG+NG mixture

Data variable	Data unit	Method of determination	Meters used
$BE_{SP3,y}$, Baseline emissions of SP3 in year y	tCO_2e	Calculated	
$PE_{SP3,y}$, Project emissions of SP3 in year y	tCO_2e	Calculated	
$MIX_{SP3,PS,RM3,y}$ RM3 consumption of COG+BFG+NG mix in year y	1000 m^3	Measured	$MMIX_{RM3}$
$MIX_{SP3,PS,WRRM3,y}$ WRRM3 consumption of COG+BFG+NG mix in year y	1000 m^3	Measured	$MMIX_{WRRM3}$
$MIX_{SP3,PS, LSRM5,y}$ LSRM5 consumption of COG+BFG+NG mix in year y	1000 m^3	Measured	$MMIX_{LSRM5}$
$MIX_{SP3,PS,WRRM1,y}$ WRRM1 consumption of COG+BFG+NG mix in year y	1000 m^3	Measured	$MMIX_{WRRM1}$
$NG_{Dir,SP3,PS,RM3,y}$ Direct consumption of NG by RM3 in year y	1000 m^3	Measured	$MNG_{Dir,RM3}$
$NG_{Dir,SP3,PS,WRRM3,y}$ Direct consumption of NG by WRRM3 in year y	1000 m^3	Measured	$MNG_{Dir,WRRM3}$
$NG_{Dir,SP3,PS,LSRM5,y}$ Direct consumption of NG by LSRM5 in year y	1000 m^3	Measured	$MNG_{Dir,LSRM5}$
$NG_{Dir,SP3,PS,WRRM1,y}$ Direct consumption of NG by WRRM1 in year y	1000 m^3	Measured	$MNG_{Dir,WRRM1}$
$NG_{SP3,BS,RM3,y}$ Baseline NG consumption by RM3 in year y	1000 m^3	*Calculated*	
$NG_{SP3,BS,WRRM3,y}$ Baseline NG consumption by WRRM3 in year y	1000 m^3	*Calculated*	

$NG_{SP3,BS,LSRM5,y}$ Baseline NG consumption by LSRM5 in year y	1000 m^3	*Calculated*	
$NG_{SP3,BS,WRRM1,y}$ Baseline NG consumption by WRRM1 in year y	1000 m^3	*Calculated*	
$NG_{SP3,PS,RM3,y}$ Project NG total consumption of RM3 in year y	1000 m^3	*Calculated*	
$NG_{SP3,PS,WRRM3,y}$ Project NG total consumption of WRRM3 in year y	1000 m^3	*Calculated*	
$NG_{SP3,PS,LSRM5,y}$ Project NG total consumption of LSRM5 in year y	1000 m^3	*Calculated*	
$NG_{SP3,PS,WRRM1,y}$ Project NG total consumption of WRRM1 in year y	1000 m^3	*Calculated*	
$NG_{MIX,SP3,PS,RM3,y}$ Project NG consumption of RM3 from gas mix in year y	1000 m^3	*Calculated*	
$NG_{MIX,SP3,PS,WRRM3,y}$ Project NG consumption of WRRM3 from gas mix in year y	1000 m^3	*Calculated*	
$NG_{MIX,SP3,PS,LSRM5,y}$ Project NG consumption of LSRM5 from gas mix in year y	1000 m^3	*Calculated*	
$NG_{MIX,SP3,PS,WRRM1,y}$ Project NG consumption of WRRM1 from gas mix in year y	1000 m^3	*Calculated*	
$\%NG_{MIX,SP3,PS,y}$ share of NG in gas mix in year y	dimensionless	*Calculated*	
$BFG_{CGMS,y}$ Amount of BFG used at CGMS in year y	1000 m^3	*Measured*	$MBFG_{CGMS}$
$COG_{CGMS,y}$ Amount of COG used at CGMS in year y	1000 m^3	*Measured*	$MCOG_{CGMS}$
$NG_{CGMS,y}$ Amount of NG used at CGMS in year y	1000 m^3	*Measured*	MNG_{CGMS}
$V_{\sum CGMS,y}$ Arifmetic sum of individual gases consumption at CGMS in year y	1000 m^3	*Calculated*	Sum of $MBFG_{CGMS}$, $MCOG_{CGMS}$ and MNG_{CGMS}
$NCV_{NG,y}$ Net calorific value NG in year y	kcal/m^3	Gas suppliers certificate	
$NCV_{MIX,SP3,PS,y}$ Net calorific value of COG+BFG+NG mix supplied to rolling mills	kcal/m^3	Calculated	
$NCV_{BFG,y}$ net calorific value of BFG in year y	kcal/m^3	*Measured by BF lab; Gas volumes are converted to default 1000* kcal/m^3	

$NCV_{COG,y}$ net calorific value of COG in year y	kcal/m^3	*Measured by coke plant lab; Gas volumes are converted to default 4000* kcal/m^3	

Table 21: List of variables of SP3

B.2.3. Data concerning GHG emissions by sources of the project activity:

<u>Subproject 3: Switch from NG to BFG+COG+NG mixture</u>

Period: 2011 year			
Parameter	**Description**	**Data unit**	**Value**
$NG_{SP3,PS,RM3,y}$	RM3 NG total consumption in year y	1000 m^3	11 423.95
$NG_{Dir,SP3,PS,RM3,y}$	RM3 direct NG consumption in year y	1000 m^3	9 534.00
$NG_{MIX,SP3,PS,RM3,y}$	RM3 NG consumption originated from the gas mix in year y	1000 m^3	1 889.95
$MIX_{SP3,PS,RM3,y}$	Total RM3 gas mix consumption in year y	1000 m^3	78 748.00
$NG_{SP3,PS,WRRM3,y}$	WRRM3 NG total consumption in year y	1000 m^3	16 916.24
$NG_{Dir,SP3,PS,WRRM3,y}$	WRRM3 direct NG consumption in year y	1000 m^3	15 020.00
$NG_{MIX,SP3,PS,WRRM3,y}$	WRRM3 NG consumption originated from the gas mix in year y	1000 m^3	1 896.24
$MIX_{SP3,PS,WRRM3,y}$	Total WRRM3 gas mix consumption in year y	1000 m^3	79 010.00
$NG_{SP3,PS, LSRM5,y}$	LSRM5 NG total consumption in year y	1000 m^3	37 732.71
$NG_{Dir,SP3,PS,LSRM5,y}$	LSRM5 direct NG consumption in year y	1000 m^3	34 262.00
$NG_{MIX,SP3,PS, LSRM5,y}$	LSRM5 NG consumption originated from the gas mix in year y	1000 m^3	3 470.71
$MIX_{SP3,PS, LSRM5,y}$	Total LSRM5 gas mix consumption in year y	1000 m^3	144 613.00
$NG_{SP3,PS, WRRM1,y}$	WRRM#1 total NG consumption in year y	1000 m^3	15 922.17

$NG_{Dir,SP3,PS,WRRM1,y}$	WRRM#1 direct NG consumption in year y	1000 m^3	74 507.00
$NG_{MIX,SP3,PS, WRRM1,y}$	WRRM#1 NG consumption originated from the gas mix in year y	1000 m^3	1 788.17
$MIX_{SP3,PS, WRRM1,y}$	Total WRRM1 gas mix consumption in year y	1000 m^3	74 507.00
$\%NG_{MIX,SP3,PS,y}$	Volumetric share of NG in gas mix in year y	dimensionless	0.024
$BFG_{CGMS,y}$	Volume of BFG used at CGMS in year y	1000 m^3	362 086
$COG_{CGMS,y}$	Volume of COG used at CGMS in year y	1000 m^3	91 867
$NG_{CGMS,y}$	Volume of NG used at CGMS in year y	1000 m^3	11 150
$V_{\sum CGMS,y}$	Total volume of gases used in year y	1000 m^3	465 103
$NCV_{NG,y}$	Net calorific value NG in year y	kcal/m^3	8 121
$NCV_{BFG,y}$	Net calorific value BFG in year y	kcal/m^3	1 000
$NCV_{COG,y}$	Net calorific value COG in year y	kcal/m^3	4 000
$NCV_{MIX,SP3,PS,y}$	Average weighted NCV of gas mixture in year y	kcal/m^3	1 763.27

Table 22: Data collected in project scenario of SP3

B.2.4. Data concerning GHG emissions by sources of the baseline:

Subproject 3: Switch from NG to BFG+COG+NG mixture

Period: 2011 year			
Parameter	**Description**	**Data unit**	**Value**
$NG_{SP3,BS,RM3,y}$	Baseline NG consumption of RM3 in year y	1000 m^3	26 632.14
$NG_{Dir,SP3,PS,RM3,y}$	RM3 direct NG consumption in year y	1000 m^3	9 534.00
$MIX_{SP3,PS,RM3,y}$	Total RM3 gas mix consumption in year y	1000 m^3	78 748.00
$NG_{SP3,BS,WRRM3,y}$	Baseline NG consumption of WRRM3 in year y	1000 m^3	32 175.03
$NG_{Dir,SP3,PS,WRRM3,y}$	WRRM3 direct NG consumption in year y	1000 m^3	15 020.00

$MIX_{SP3,PS,WRRM3,y}$	Total WRRM3 gas mix consumption in year y	1000 m^3	79 010.00
$NG_{SP3,BS,LSRM5,y}$	Baseline NG consumption of LSRM5 in year y	1000 m^3	65 661.06
$NG_{Dir,SP3,PS,LSRM5,y}$	LSRM5 direct NG consumption in year y	1000 m^3	34 262.00
$MIX_{SP3,PS,LSRM5,y}$	Total LSRM5 gas mix consumption in year y	1000 m^3	144 613.00
$NG_{SP3,BS,WRRM1,y}$	Baseline NG consumption of WRRM1 in year y	1000 m^3	30 311.31
$NG_{Dir,SP3,PS,WRRM1,y}$	WRRM1 direct NG consumption in year y	1000 m^3	14 134.00
$MIX_{SP3,PS,WRRM1,y}$	Total WRRM1 gas mix consumption in year y	1000 m^3	74 507.00
$NCV_{MIX,SP3,PS,y}$	NCV of gas mix in year y	kcal/m^3	1 763.27
$NCV_{NG,y}$	Net calorific value NG in year y	kcal/m^3	8 121

Table 23: Data collected for the baseline SP3

B.2.5. Data concerning leakage:

Not applicable

B.2.6. Data concerning environmental impacts:

Monitoring of environmental impacts due to operation of the plant is performed in accordance to the company standard STP 192-09-2008 named “System of environmental management. Monitoring and measurements” which conforms applicable environmental, health and safety norms of Ukraine in force. Monitoring includes the instrumental control of:

- industrial emissions caused by stationary sources;
- efficiency of operation of de-dusting and flue gas cleaning installations;
- quality of ambient air at the plant sanitary boundaries and zones of influence of different plant units;
- quality of ambient air at the places of waste removal, places where the explosive work are being carried out and also at the living districts of the city of Kryviy Rih;
- quality of sewage waters, waste waters and recycled waters;
- quality of soil at the sanitary border of AMKR and at the waste disposal areas.

Waste management is prescribed by plant standard STP 192-13-2006 which conforms to the state standard DSTU 1.5.2003 and ISO 14001:2004.

B.3. Data processing and archiving (incl. software used):

In regard of data processing and archiving the Management of AMKR:

- Organizes monitoring (the appropriate orders and instructions may be issued, specifying the responsible executors, monitoring and reporting are carried out),
- Recording the required data, monitoring and reporting on the project GHG emissions at the plant
- Operation of power plant equipment,
- All data archived will be kept for at least two years after the last transfer of ERUs to the client.

B.4. Special event log:

- All special events will be recorded in the shift-charge engineers' log book

There were no any special events during the monitored period.

SECTION C. Quality assurance and quality control measures

C.1. Documented procedures and management plan:

C.1.1. Roles and responsibilities:

The general project management will be implemented by Mr. Vadim Yova, Manager for fuel & energy resources use, through supervising and coordinating activities of his subordinates and other plant divisions. His work will be supported by the assistance of Energy department of AMKR headed by Director for energy, Mr. Alexander Kamenev. The department will be responsible for routine preparation and keeping the performance forms, which record the project variables. Within this responsibility he interacts with plant divisions in getting necessary performance data for subprojects included in the MR. The processing of metered data of consumption, pressure and temperature of gases, including of NG, COG and BFG is performed on daily basis by service for automation of technological processes. This service is responsible for processing the circular diagrams containing daily curves of respective parameters and obtains the consumption in m^3.
The plant laboratory is responsible for measurement of net calorific value (NCV) of fuels used, except for natural gas. The NCV of NG is obtained regularly from gas supplier. The process flow of data collection from primary data to reported totals is presented in Figure 1.

C.1.2. Trainings:

The management of the personnel training and retraining at the plant is carried out by the Technical Director, and the control of implementation thereof − by the Head of the enterprise.

Depending on the category of the personnel, the following methods are applied:
- Checking the knowledge of the regulations, norms and instructions related to process, labor protection, industrial and fire safety;
- On-going training and retraining.

The activity with the personnel is organized and carried out in accordance with the plans approved by the Chief Engineer of the plant that include the following:
- Entry training;
- Personnel training in second and allied professions;
- Re-training;
- Organizing the activity of the technical libraries, technical materials rooms and simulator training facilities.

Personnel involved in monitoring process will be trained and instructed according to the MP.

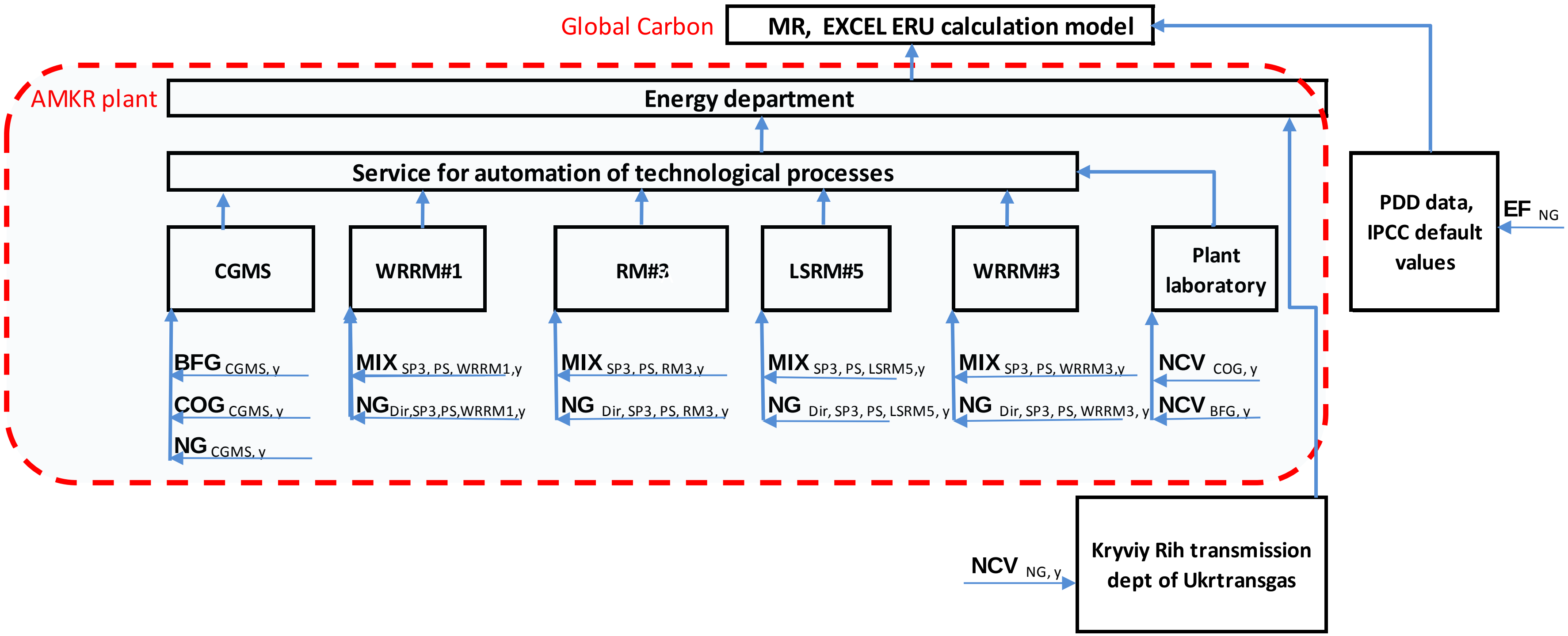

Figure 1: Data flow diagram

C.2. Involvement of Third Parties:

The calibration of metering equipment which can't be calibrated by the plant services and accreditation of the AMKR laboratories is done by State Dnepropetrovsk regional center for standardization, metrology and certification (SE "Dneprstandartmetrology").

C.3. Internal audits and control measures:

All metering equipment is controlled by the Instrument department of PJSC ArcelorMittal. According to the attestation certificate #06544-2-4-25/2 GOMS from 12/11/2010 issued by Ministry of Industrial Policy of Ukraine, the Instrument department is accredited for performing of calibration of metering devices for internal needs. The certificate is valid until 12/11/2013. The service makes periodical checking and calibration of metering equipment as per approved schedule and equipment manual.

In total, AMKR applies about 70 000 measurement and instrumentation devices. This number includes thermometers, manometers, data recorders/loggers as well as power and flow meters of different type used for both, commercial and process measurement/control.

To run, maintain and calibrate this large massive of devices, a number of plant standards, procedures and manuals has been adopted:

1) In accordance to the Law of Ukraine “On metrology and metrological activities” the calibration of measurement devices using state standard DSTU 2708:2006 “Calibration of measurement equipment. Organization and routine”
2) Data base (DB) of electronic passports of measurement devices named “Accounting of measurement devices at the plant” has been developed and adopted. Operation of the DB is regulated by several manuals:
   a. UK.CIT.I.0053 manual for user of DB “Accounting of measurement devices at the plant”;
   b. UK.CIT.I.0079 manual for performing control of calibration schedules using the DB;
   c. UK.CIT.I.0066 manual for preparation of reporting using the DB;
   d. IMC.228.005-2008 manual for performing the data input in the DB.
3) Quality management system of AMKR is ISO 9003, 9002 and 9001 certified since September 1994. Last re-certification visit was conducted from 16 to 18 of May 2011 and in the result the TNO Certification, Netherlands has confirmed the compliance of quality management system to the requirement of ISO 9001:2008 “Quality management system-requirements”. Next certification visit will take place in 2012.

C.4. Troubleshooting procedures:

The troubleshooting is made by maintenance mechanics or on-duty operator. The internal system requires that a broken meter has to be replaced in few hours by the Instrument department.

SECTION D. Calculation of GHG emission reductions

D.1. Formulas used for calculations

D.1.1. Formulas used to calculate project emissions:

Subproject 3: Switch from NG to BFG+COG+NG mixture

Emissions in project scenario are the emissions due to NG consumption by RM3, WRRM1, WRRM3 and LSRM5 in form of direct consumption and consumption of NG as part of gas mix:

$$PE_{SP3,y} = \sum_i PE_{SP3,i,y} \qquad (1)$$

Where:

$PE_{SP3,y}$ Project emissions of SP 3 in year y (tCO_2e)
i RM3, WRRM1, WRRM3 and LSRM5
$PE_{SP3,i,y}$ Project emissions of RM3, WRRM1, WRRM3 and LSRM5 in year y (tCO_2e)

$$PE_{SP3,i,y} = NG_{SP3,PS,i,y} \times NCV_{NG,y} \times EF_{NG} \times 4.1868 \div 1000 \qquad (2)$$

Where:

i RM3, WRRM1, WRRM3 and LSRM5
$PE_{SP3,i,y}$ Project emissions of RM3, WRRM1, WRRM3 and LSRM5 in year y (tCO_2e)
$NG_{SP3,PS,i,y}$ Total (direct and indirect (with gas mix)) NG consumption of RM3, WRRM1, WRRM3 and LSRM5 in year y (1000 m^3)
$NCV_{NG,y}$ NCV of NG in year y ($kcal/m^3$)
EF_{NG} Carbon dioxide emission factor for natural gas combustion (tCO_2/GJ)
4.1868/1000 Unit conversion factor from $kcal/m^3$ into GJ/1000 m^3 (The IPCC conversion factors have been applied[8])

[8] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/1_Volume1/V1_8x_Ch8_An1_Units_Index.pdf

The total NG consumption of RM3, WRRM1, WRRM3 and LSRM5 in year y is calculated as follows:

$$NG_{SP3,PS,i,y} = NG_{Dir,SP3,PS,i,y} + NG_{MIX,SP3,PS,i,y} \quad \textbf{(3)}$$

Where:

i	RM3, WRRM1, WRRM3 and LSRM5
$NG_{Dir,SP3,PS,i,y}$	Direct NG consumption by RM3, WRRM1, WRRM3 and LSRM5 in year y (1000 m^3)
$NG_{MIX,SP3,PS,i,y}$	Consumption of NG by RM3, WRRM1, WRRM3 and LSRM5 as part of gas mix in year y (1000 m^3)

The NG consumption by RM3, WRRM1, WRRM3 and LSRM5 as a part of gas mix is calculated as follows:

$$NG_{MIX,PS,i,y} = MIX_{SP3,PS,i,y} \times \%NG_{MIX,SP3,PS,y} \quad \textbf{(4)}$$

Where:

i	RM3, WRRM1, WRRM3 and LSRM5
$MIX_{SP3,PS,i,y}$	Gas mix consumption by RM3, WRRM1, WRRM3 and LSRM5 in year y (1000 m^3)
$\%NG_{MIX,SP3,PS,y}$	Volumetric share of NG in gas mix in year y (dimensionless)

Gas mix is prepared at the central gas mixing station from COG, BFG and NG where the volumes of these three gases are measured. Then the mix is supplied to all rolling mills therefore the composition of mix and share on NG in it for all of them will be the same.
To calculate the share of NG in the gas mix the measured annual volumes of individual gases are used:

$$\%NG_{MIX,PS,y} = NG_{CGMS,y} \div V_{\sum CGMS,y} \quad \textbf{(5)}$$

Where:

$NG_{CGMS,y}$	Consumption of NG by CGMS in year y (1000 m^3)
$V_{\sum CGMS,y}$	Sum of COG, BFG and NG consumptions at CGMS in year y (1000 m^3)

The sum of gases consumptions is calculated as arithmetic sum of NG, COG and BFG consumptions at CGMS as shown below:

$$V_{\sum CGMS,y} = NG_{CGMS,y} + COG_{CGMS,y} + BFG_{CGMS,y} \quad \textbf{(6)}$$

Where:

$NG_{CGMS,y}$; $COG_{CGMS,y}$ and **$BFG_{CGMS,y}$** Consumption of NG, COG and BFG at the CGMS in year y (1000 m^3)

D.1.2. Formulas used to calculate baseline emissions:

Subproject 3: Switch from NG to BFG+COG+NG mixture

Emissions of SP3 in the baseline are calculated using the following equations:

$$BE_{SP3,y} = \sum_i BE_{SP3,i,y} \quad \textbf{(7)}$$

Where:

$BE_{SP3,y}$ Baseline emissions of SP 3 in year y (tCO_2e)
$BE_{SP3,i,y}$ Baseline emissions of RM3, WRRM1, WRRM3 and LSRM5 in year y (tCO_2e)
i RM3, WRRM1, WRRM3 and LSRM5

$$BE_{SP3,i,y} = NG_{SP3,BS,i,y} \times NCV_{NG,y} \times EF_{NG} \times 4.1868 \div 1000 \quad \textbf{(8)}$$

Where:

$BE_{SP3,I,y}$ Baseline emissions of RM3, WRRM1, WRRM3 and LSRM5 in year y (tCO_2e)
$NG_{SP3, BS,i,y}$ Baseline NG consumption of RM3, WRRM1, WRRM3 and LSRM5 in year y (1000 m^3)
i RM3, WRRM1, WRRM3 and LSRM5
$NCV_{NG,y}$ NCV of NG in year y (kcal/m^3)
EF_{NG} Carbon dioxide emission factor for natural gas combustion (tCO_2e/GJ)
4.1868/1000 Unit conversion factor from kcal/m^3 into GJ/1000 m^3 (The IPCC conversion factors have been applied[9])

[9] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/1_Volume1/V1_8x_Ch8_An1_Units_Index.pdf

In the baseline, only NG is used to cover the heat demand of SP3 which in the project scenario is covered by all three gases. Therefore the heat content of gas mix in the baseline shall be recalculated using NCV of NG to the baseline volume of NG:

$$NG_{SP3,BS,i,y} = \frac{(NG_{Dir,SP3,PS,i,y} \times NCV_{NG,y} + MIX_{SP3,PS,i,y} \times NCV_{MIX,SP3,PS,y})}{NCV_{NG,y}} \quad \textbf{(9)}$$

Where:

$NG_{Dir,SP3,PS,i,y}$	Direct NG consumption of RM3, WRRM1, WRRM3 and LSRM5 in year y (1000 m^3)
i	RM3, WRRM1, WRRM3 and LSRM5
$NCV_{NG,y}$	NCV of NG in year y (kcal/m^3)
$MIX_{SP3,PS,i,y}$	BFG+COG+NG gas mix consumption of RM3, WRRM1, WRRM3 and LSRM5 in year y (1000 m^3)
$NCV_{MIX,SP3,PS,y}$	Net calorific value of gas mix in year y (kcal/m^3)

The net calorific value of the gas mix prepared at CGMS is calculated as weighted average by their calorific values of volumes of individual gases supplied to CGMS as shown in equation below:

$$NCV_{MIX,SP3,PS,y} = \frac{(NG_{CGMS,y} \times NCV_{NG,y} + COG_{CGMS,y} \times NCV_{COG,y} + BFG_{CGMS,y} \times NCV_{BFG,CGMS,y})}{V_{\sum CGMS,y}} \quad \textbf{(10)}$$

Where:

$NG_{CGMS,y}$; $COG_{CGMS,y}$ and $BFG_{CGMS,y}$	Consumption of NG, COG and BFG at the CGMS in year y (1000 m^3)
$NCV_{NG,y}$; $NCV_{COG,y}$ and $NCV_{BFG,y}$	Net calorific values of NG, COG and BFG in year y (kcal/m^3)
$V_{\sum CGMS,y}$	Sum of COG, BFG and NG consumption at CGMS in year y (1000 m^3) as defined by equation (6).

D.1.3. Formulas used to calculate emission reductions:

Subproject 3: Switch from NG to BFG+COG+NG mixture

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

Where:
$ER_{SP3,y}$ Emission reduction of the SP3 in year y (tCO_2e)
$BE_{SP3,y}$ Baseline emissions of SP3 in year y (tCO_2e)
$PE_{SP3,y}$ Project emissions in year of SP3 in year y (tCO_2e)

Resulting emission reduction for 2011 is the emission reduction of subproject SP3:

$$ER_y = ER_{SP3,y} \quad \textbf{(12)}$$

D.2. Description and consideration of measurement uncertainties and error propagation:

All measurement uncertainties and error propagation are according to the passports of measuring equipment and the calibration certificates.

D.3. GHG emission reductions (referring to B.2. of this document):

D.3.1. Project emissions:

Subproject 3: Switch from NG to BFG+COG+NG mixture

Monitoring period		**2011**
Project emissions (PE)	tCO_2e	**156 402**

Table 24: Project emissions in Subproject 3

D.3.2. Baseline emissions:

Subproject 3: Switch from NG to BFG+COG+NG mixture

Monitoring period		2011
Baseline emissions (BE)	tCO_2e	**295 235**

Table 25: Baseline emissions in Subproject 3

D.3.3. Leakage:

N.A.

D.3.4. Summary of the emission reductions during the monitoring period:

Subproject 3: Switch from NG to BFG+COG+NG mixture

Monitoring period		2011
Emission reductions (ER)	tCO_2e	**138 833**

Table 26: Emission reductions in Subproject 3

ER 2011

Monitoring period		2011
Emission reductions (ER)	tCO_2e	**138 833**

Table 27: Total amount of ER generated in 2011

Annex 1

Definitions and acronyms

ERU	Emission Reduction Units
CO_2	Carbon Dioxide
GHG	Greenhouse Gases
GJ	Gigajoule
IPCC	Intergovermental Panel on Climate Change
PDD	Project Design Document
WRRM1	Wire rod rolling mill #1 (actual name of the mill is PS 150-1)
WRRM3	Wire rod rolling mill #3 (actual name of the mill is PS 250-3)
LSRM5	Light-section rolling mill #5 (actual name of the mill is MS 250-5)
RM3	Rolling mill #3 (actual name of the mill is PS #3)
CGMS	Central gas mixing station (mixing of NG, COG and BFG for use at RMs)
SP1...SP8	Subprojects 1 to 8

Definitions:

Joint Implementation (JI)
Mechanism established under Article 6 of the Kyoto Protocol.
JI provides Annex I countries or their companies the ability to jointly implement greenhouse gas emission reduction or sequestration projects that generate Emission reduction Units.

Monitoring plan
Plan describing how monitoring of emission reductions will be undertaken. The monitoring plan forms a part of the Project Design Document (PDD).

Baseline
The scenario that reasonably represents what would have happened to greenhouse gases in the absence of the proposed project, and covers emissions from all gases, sectors and source categories listed in Annex A of the Protocol and anthropogenic Removals by sinks, within the project boundary.

Emission reductions
Emission reductions generated by a JI project that have not undergone a verification or determination process as specified under the JI guidelines, but are contracted for purchase.

Greenhouse gas (GHG)
A gas that contributes to climate change. The greenhouse gases included in the Kyoto Protocol are: carbon dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O), Hydrofluorcarbons (HFCs), Perfluorcarbons (PFCs) and Sulphurhexafluoride (SF_6).

Annex 2

Changes during project implementation

Description of changes from a determined PDD occurred during project implementation

Annex 2 contains description and justification of changes occurred during implementation of the JI project as required by procedures regarding changes during project implementation[10].

Project design document for a JI project "Energy efficiency investment program at OJSC ArcelorMittal Kryviy Rih"[11] was created during 2006-2007 and reflects the scope of energy efficiency investment program as of this period.

First version of PDD was completed on 23 July 2007 and then had been determined as track 1 project on the 16 September 2009.

PDD is based on energy efficiency investment program mainly aimed at demand side improvements. The following subprojects have been identified and included into the determined PDD:

Sub project
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

Table 28: Energy Efficiency Investment Program

[10] http://ji.unfccc.int/Sup_Committee/Meetings/022/Reports/Annex2.pdf|

[11] PDD is available at: http://ji.unfccc.int/JI_Projects/DB/285ML83S8HRCTFB8Y0LFZJK23Q45TJ/PublicPDD/U781XZRM1P8BC6UFIIA6BGKNLFWIB9/view.html

Description of proposed changes

In the PDD the subproject #3: “Fuel switch from natural gas to coke oven, blast furnace and natural gas mixture” foresees the following two actions[12]:

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.

Action a) at rolling shop #3 has been successfully implemented as described in PDD on 21/05/2008 and has been operating since then.

Implementation of action b) experienced changes; the decision was made to implement the fuel switch from NG to GOG, BFG and NG mixture not at the refractory kilns and lime rotary kilns, but to extend the project to other rolling mills of the plant. This resulted in the fact that Light-section rolling mill #5 (LSRM5), Wire rod rolling mill #3 (WRRM3) and Wire rod roiling mill #1 (WRRM1) have been successfully commissioned for operation on the fuel mix:

- Light-section rolling mill #5 fuel switch commissioning was completed in November 2009;
- Wire rod rolling mill #3 fuel switch commissioning was completed in June 2008;
- Wire rod roiling mill #1 fuel switch commissioning was completed in January 2011.

Thus the changes during project implementation consist of removing action b) of subproject 3 (Switch from NG to NG+BFG mixture in refractory and Lime Rotary kilns) and inclusion as new action b) the fuel switch from NG to COG, BFG and NG mix at other rolling mills of the plant.

The detailed technical project description, emission sources and baseline are described below in details.

[12] PDD section *A.4.2.3 SP3*

Project description
The flow diagrams of fuel supply to rolling mills of the plant before and after the project implementation are shown below:

Fuel supply and measurement diagram of RM#3, WRRM#1, WRRM#3 and LRSM#5 before the fuel switch from NG to COG+BFG+NG project implementation

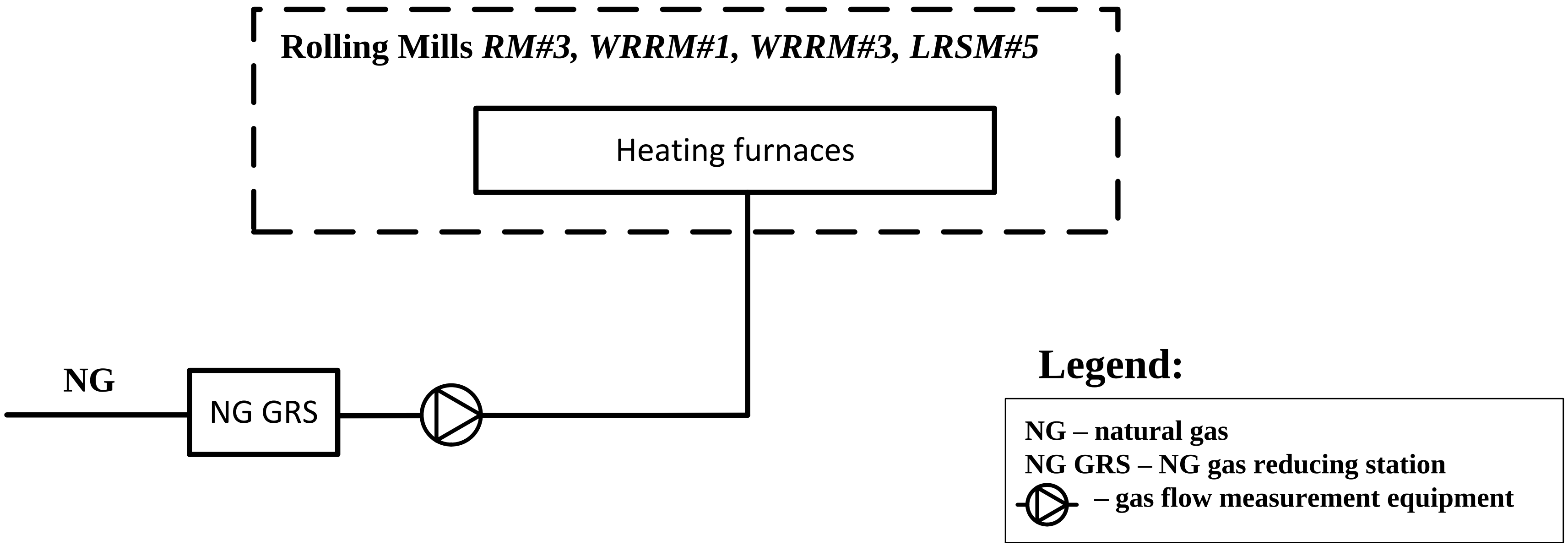

Figure 2: Flow and metering diagram of proposed SP3 action b) fuel switch from NG to BFG+COG+NG mixture, situation before the project implementation

Fuel supply and measurement diagram of RM#3, WRRM#1, WRRM#3 and LRSM#5 after the fuel switch from NG to COG+BFG+NG project implementation

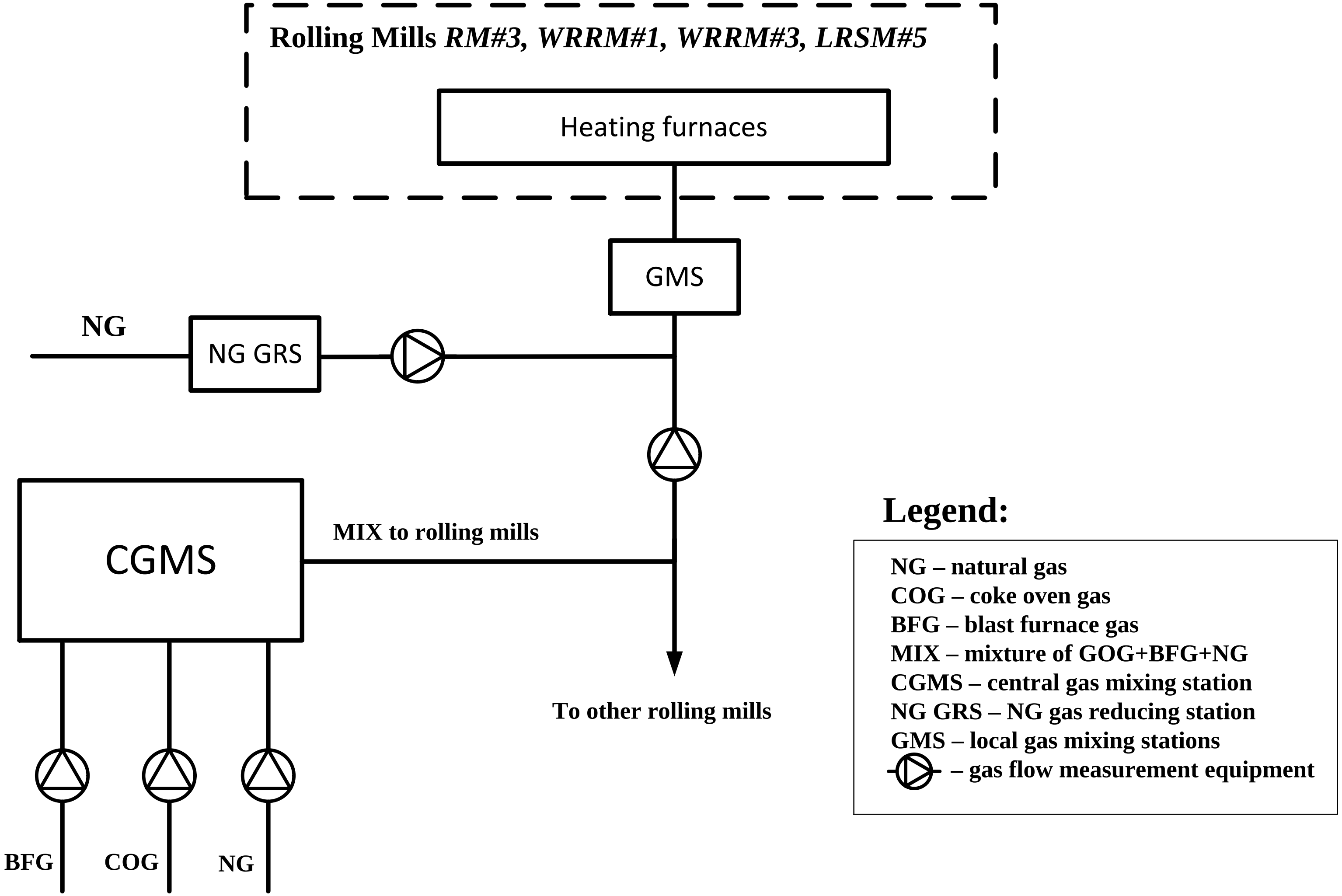

Figure 3: Flow and metering diagram of proposed SP3 action b) fuel switch from NG to BFG+COG+NG mixture, situation after the project implementation

Physical location of the project

Proposed activities are located at the same site. Therefore, the physical location of the project remains the same: facilities of ArcelorMittal in Kryviy Rih.

Update in monitoring plan reflecting emission source change

Similar to the action *a)* of SP3 in PDD [13], the COG and BFG, together with NG would be used to heat the furnaces of Light-section rolling mill #5, Wire rod rolling mill #3, and Wire rod roiling mill #1 which have been successfully commissioned for operation on the fuel mix in the project scenario.

In the baseline scenario the rolling mills would continue using NG only. The heat content of COG and BFG would continue to be flared, in full accordance to baseline approach described in the PDD.

The monitoring of emissions reduction occurred due to this change will be similar to the monitoring of emissions reduction from fuel switch at Rolling mill #3. To monitor the emissions reduction, the actual amount of gas mix will be metered; the NCV of gas mix will be calculated as weighted average, based on metered consumption of individual gases at CGMS and NCV of each of the gases. In the baseline scenario all the heat supplied to Light-section rolling mill #5, Wire rod rolling mill #3, and Wire rod roiling mill #1 is covered by NG only, while in the project scenario all three gases contribute their calorific values. The total amount of heat consumed is equal in project and baseline scenarios.

It has been reflected in an updated monitoring plan which includes now the action b) of subproject 3 as described above.

Baseline scenario

In the baseline scenario LSRM5, WRRM3 and WRRM1, similar to RM3 would continue using NG only. The heat content of COG and BFG would continue to be flared, in full accordance with the baseline approach described in the PDD. Therefore, the proposed change does not affect the baseline scenario of the PDD in which the COG and BFG would be flared and NG combusted to cover the heat demand of the rolling shops.

Consistency with JI specific approach

The baseline setting for this sub-project refers to the methodology ACM0009 since it is related to fuel-switching projects. Differently from 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;

[13] See PDD section *A.4.2.3SP3 - Switch fuel from NG to COG+BFG+NG mixtures*

- 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.

These requirements are met by the changes in project implementation described in this Annex.

Therefore a JI specific approach based on some elements of existing methodologies has been used both for baseline setting and for monitoring.

According to the paragraph 8 of Changes during project implementation[14], "A positive determination opinion…shall be a condition for expressing a positive verification opinion in any verification reports provided by an AIE following the changes reoffered to in paragraphs 6 and 7 above."

[14] http://ji.unfccc.int/Sup_Committee/Meetings/022/Reports/Annex2.pdf