SECOND PERIODIC ANNUAL JI MONITORING REPORT

Version 3.0

11 June 2013

CONTENTS

SECTION A. General project activity and monitoring information

A.1 Title of the project activity:

"Switch from wet-to-dry process at Podilsky Cement, Ukraine".

Sectoral scope: 4. Manufacturing industries

A.2. JI registration number:

Reference number: 0001

ITL Project ID: UA2000001

A.3. Short description of the project activity:

Cement production is a highly energy intensive process that generates significant emissions of greenhouse gases, in particular CO_2. There are two main sources of CO_2 emissions in the cement production process. The first source is fossil fuel combustion and the second source is the chemical decomposition of the limestone into calcium oxide and carbon dioxide. The project significantly decreases emissions of the first source (fossil fuel combustion) at Podilsky Cement Plant in Ukraine by changing the cement production process from wet to dry.

The Podilsky Cement Plant has been constructed in the 1970s and was originally equipped with six cement producing kilns using wet production process. The project significantly decreases the emissions of fossil fuel combustion by changing the technology of cement production from wet to dry.

The average energy consumption at Podilsky Cement over the years of only wet process production was 6.771 GJ per tonne of clinker produced. Energy consumption of the dry cement production system at Podilsky Cement is approximately 3.180 GJ per tonne of clinker produced. This constitutes reduction of 53% in energy consumption.

The proposed JI project includes the following activities:

- Preparation of the site, including removal of obsolete installations;
- Installation of equipment for milling and homogenization of the raw material;
- Installation of a pre-calciner and preheater tower;
- Installation of a new kiln for dry cement production;
- Gradual switch of production to the dry process.

A.4. Monitoring period:

- Monitoring period starting date: 01/01/2012;
- Monitoring period closing date: 31/12/2012[1].

A.5. Methodology applied to the project activity:

The JI-specific approach is used for the monitoring of emission reductions in accordance with the appendix B of the JI guidelines[2].

[1] Both days included.

[2] The annex of decision 9/CMP.1.

A.5.1. Baseline methodology:

The baseline methodology and scenario has been described in the PDD version 2.1. dated 2nd of February 2007, Section B.1. The determination of the project has been deemed final by the JISC.

The baseline is the scenario that reasonably represents the anthropogenic emission by source of greenhouse gases that would occur in absence of the proposed project. In many CDM methodologies the approach to establish the baseline is firstly to identify several baseline alternatives. As the proposed project is not registered as a JI project, should be included as an alternative as well. These alternatives should be assessed whether or not these alternatives are credible and plausible. Where more than one credible and plausible alternative remains, project participants shall, as a conservative assumption, use the alternative baseline scenario that results in the lowest baseline emissions as the most likely baseline scenario. There should be consistency between baseline scenario determination and additionality determination.

The approach described above has been used to identify the baseline scenario for this JI project. The identified baseline scenario for this project is: *Production of cement using a wet process with coal as fuel.*

A.5.2. Monitoring methodology:

For the elaboration of monitoring methodology JI-specific approach was used (see baseline methodology). The project activity only affects the emissions related to the kiln fuel, the electricity consumption of the raw milling, the kilns and the coal mill, plus the emission from the heat generator of the coal mill. For the purpose of establishing the baseline emissions and to monitor the project emissions, only these emissions will be monitored. Please note that, as part of the in-house reporting system at Podilsky Cement Plant, all emissions are monitored using the WBCSD[3] "CO_2 Emissions Monitoring and Reporting Protocol for the Cement Industry".

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

The project has been started in year 2006 when the decision to proceed with the project has been taken by the ownership of Podilsky Cement Plant – CRH Group.

Activity	Date in the PDD	Actual date
Kiln for wet cement production #1 stopped	-	August 2011
Kiln for wet cement production #3 stopped*	-	October 2011
Kiln for wet cement production #4 stopped	-	November 2011
Kiln for wet cement production #5 stopped**	-	October 2011
Kiln for wet cement production #6 stopped**	-	October 2011
Project approval by the CRH Board	December 2006	December 2006
Determination of the project has been deemed final by the JISC	March 2007	March 2007
Start of construction of the new dry kiln	December 2007	December 2007
Start-up of the new kiln for dry cement production	July 2009	30 September 2011

* There is no kiln for wet cement production #2

** These kilns were in operation in July-October 2012.

Table 1: Implementation plan

[3] World Business Council for Sustainable Development

The commissioning of the new kiln has occurred later than expected in the PDD. According to the initial plan it should have happened in 2009. Due to the slowdown in the second half 2008 and following significant recession in construction industry in Ukraine in 2009 and 2010 the construction of the kiln was slowed down so that the commissioning has been postponed until late 2011.

Letters of Approval were issued by both Parties involved mentioned in the PDD:

Letter of Approval from the Ministry of Environmental Protection of Ukraine #11672/10/3-10 dated 27th of December 2006.

Letter of Approval from the Environmental Protection Agency of Ireland #FP-IE-07-001a dated 19th of January 2007.

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

There are no deviations to the PDD, except for revisions of the monitoring plan (refer to Section A.8.). This JI project was made publicly available on the UNFCCC website. The full text of PDD could be found at

http://ji.unfccc.int/UserManagement/FileStorage/62HINFHR08HYV4Y0O6C0074UVY11VL

The actual emission reductions in the monitoring report are different from the forecast in the registered PDD:

	Data in the PDD	Data in this report
Emission reductions in 2012, tCO_2e	762 775	396 040

Table 2: Emission reduction comparison

The differences are due to the fact that estimates in the PDD were based on forecasted data for clinker production as of 2007. Another factor was the necessity to run equipment in the commissioning mode during the initial operation period. As the result the emission reductions are lower than expected which is conservative.

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

The monitoring plan (MP) for this project has been revised, its revision was determined during verification of Initial and First Periodic Annual JI Monitoring Report "Switch from wet-to-dry process at Podilsky Cement, Ukraine", final verification report is available through: http://ji.unfccc.int/UserManagement/FileStorage/X48W6OD7FYSI20MP1CHJ9RBQVGELAT . Please refer to Annex 2 of Initial and first periodic annual JI monitoring report for the full text of the revised monitoring plan as well as reasons for such revisions. The report is published at UNFCCC JISC official web-page: http://ji.unfccc.int/UserManagement/FileStorage/NUWIK8FE1CSZ35AQJDLVRB2Y90THGX .

A.9. Changes since last verification:

To improve the monitoring process, two new natural gas metering complexes based on meters FlouTech were installed at the plant at the beginning of 2012. Please, see the details in table B.1.2. of this report. . Also it should be pointed out that due to production needs of the plant kilns #5 and #6 were in operation in July-October of 2012.

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

PJSC Podilsky Cement, CRH Ukraine:

- Barnes Murphy, Project Manager.

Global Carbon B.V.:

- Anna Vilde, Senior JI consultant.

SECTION B. Key monitoring activities

(According to the monitoring plan for the monitoring period stated in A.4.)

For the monitoring period stated in A.4. the following parameters have to be collected and registered:

1. **Indirect specific carbon dioxide emissions from electricity consumption**

   This parameter is determined as indirect specific carbon dioxide emissions from electricity consumption by the 1st class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052. These data are provided by the Designated Focal Point (DFP) of Ukraine in form of Orders or other communications. Data for 2008-2011 are already available in the orders of the National Environmental Investment Agency of Ukraine. Regular cross-checks with the DFP of Ukraine and checks of the updates of this information are performed.

2. **Coal consumption by the kilns**

   For the monitoring of this parameter the operational data, production reports and commercial data of the company are used. The direct coal consumption in the system is measured continuously during its operation by the proportioning belt scales. Write-off certificates, purchase data and stock surveys as well as other commercial documents are used in order to confirm the amount of coal consumed. For the period when both dry and wet kilns are operating simultaneously, coal consumption by both kilns is taken into account. These data are collected by the internal monitoring and reporting systems at Podilsky Cement and are used in the existing normal business practice as well as reported to national and local authorities.

3. **Natural gas consumption by the kilns**

   For the monitoring of this parameter the operational data, production reports and commercial data of the company are used. Podilsky Cement uses multi-stage accounting system, and provides data cross-check. Total natural gas consumption by the entire plant is measured by the commercial metering system and natural gas consumption for each unit is monitored by internal technical meters. As the result of previous units' operation analysis, standard values of specific natural gas consumption have been developed for each unit. Operation of previous units was analysed in different modes. The standard values are used for technical meter readings cross-checks. But for the preparation of production reports (data source for the monitoring of JI project) more accurate and transparent internal technical meter readings are used. Only in case of technical natural gas metering equipment mistakes or breakdown, consumption can be evaluated using standard specific values. This fact should be described in relevant monitoring report.

   For the period when both dry and wet kilns are operating simultaneously natural gas consumption by both kilns is taken into account. These data are collected by the internal monitoring and reporting systems at Podilsky Cement, and used in the existing normal business practice as well as reported to national and local authorities.

4. **Net Calorific Value of coal**

   For the monitoring of this parameter the laboratory reports with cross-checks from the suppliers certificates are used. When purchased, coal is accompanied by the certificate containing Net Calorific Value of coal. The Podilsky Cement's laboratory department will store these certificates, perform its own tests, if necessary, and will calculate the weighted average value of the Net Calorific Value at the end of each monitoring period.

5. Net Calorific Value of natural gas

For the monitoring of this parameter the laboratory reports with cross-checks from the supplier certificates are used. The official reports (statements) from the local gas distribution company (supplier) contain these data. Podilsky Cement's laboratory department will store these certificates and will provide the value of the Net Calorific Value at the end of each monitoring period.

6. Electricity consumption of raw milling and kiln

For the monitoring of this parameter the operational data, production reports and commercial data of the company are used. Podilsky Cement uses multi-stage accounting system, and provides data cross-check. Total electricity consumption by the entire plant is measured by the commercial metering system and electricity consumption for each unit is monitored by internal technical meters. As the result of previous units' operation analysis, standard values of specific electricity consumption have been developed for each unit. Operation of previous units was analysed in different modes. The standard values are used for technical meters' readings cross-checks. For the preparation of production reports (data source for the monitoring of JI project) more accurate and transparent internal technical meter readings are used. Only in case of electricity metering equipment mistakes or breakdown, consumption can be evaluated using standard specific electricity values. This fact should be described in relevant monitoring report.

For the period when dry and wet kilns are operating simultaneously electricity consumption by both kilns is taken into account. These data are collected by the internal monitoring and reporting systems at Podilsky Cement, and used in the existing normal business practice as well as reported to national and local authorities.

7. Electricity consumption of coal mill

For the monitoring of this parameter the operational data, production reports and commercial data of the company are used. Podilsky Cement uses multi-stage accounting system, and provides data cross-check. Total electricity consumption by the entire plant is measured by the commercial metering system and electricity consumption for each unit is monitored by internal technical meters. As the result of previous units' operation analysis, standard values of specific electricity consumption have been developed for each unit. Operation of previous units was analysed in different modes. The standard values are used for technical meter' readings cross-check. For the preparation of production report (data source for the monitoring of JI project) more accurate and transparent internal technical meter readings are used. Only in case of electricity metering equipment mistakes or breakdown, consumption can be evaluated using standard specific electricity values. This fact should be described in relevant monitoring report.

8. Natural gas consumption of the coal mill heat generator

For the monitoring of this parameter the operational data, production reports and commercial data of the company are used. Podilsky Cement uses multi-stage accounting system, and provides data cross-check. Total natural gas consumption by the entire plant is measured by the commercial metering system and natural gas consumption for each unit is monitored by internal technical meters.

As the result of previous units' operation analysis, standard values of specific electricity consumption have been developed for each unit. Operation of previous units was analysed in different modes. The standard values are used for cross-check of technical meter readings. For the preparation of production reports (data source for the monitoring of JI project) more accurate and transparent internal technical meter' readings are used. Only in case of metering equipment mistakes

or breakdown, consumption can be evaluated using standard specific values. This fact should be described in relevant monitoring report.

9. Amount of clinker produced

For the monitoring of this parameter the operational data, production reports and commercial data of the company are used. Kiln feed management system on Podilsky Cement is used as the monitoring and reporting system of clinker production as well as for data collection. Amount of clinker produced is calculated by multiplying special transition coefficient by feed (raw meal) consumption in the kiln feed management system. These data are collected by the internal monitoring and reporting systems at Podilsky Cement, and used in the existing normal business practice as well as reported to national and local authorities.

B.1.1. Monitoring equipment types

The monitoring equipment used for the monitoring of emission reductions in this project falls into several categories:

1. Electricity meters: "ACE 6000"
2. Natural gas meters: "FlouTek-TM-1-3", "FlouTek-TM", "TERZ 94"
3. Proportioning belt scales: "Gravit 100"
4. Raw Meal Feeders: "FlowMeter"

B.1.2. Table providing information on the equipment used:

ID	Measuring instrument	Unit	Manufacturer	Type	Serial number	Accuracy class or error	Last calibration	Next Calibration	Comment
NG1	"FlouTek-TM-1-3"	m^3	"DP UkrGasTech" LTD, Kiev, Ukraine	Metering system for natural gas consumption measurement	1-891	for 10-100 % ± 0.35% for 1-10 % ± 0.50%	02/09/2011	02/09/2013	Commercial metering system at gas distribution station[4].
NG2	"TERZ 94"	m^3	RMG Group, Germany	Electronic Turbine Meter	600787	for 20-100 % ± 2% for 1-20 % ± 3%	03/10/2011	03/10/2013	Natural gas consumption by the heat generator
NG3	"FlouTek-TM"	m^3	"DP UkrGasTech" LTD, Kiev, Ukraine	Metering system for natural gas consumption measurement	1-1722	for 10-100 % ± 0.35% for 1-10 % ± 0.50%	06/04/2012	06/04/2014	Natural gas consumption by raw material workshop
NG4	"FlouTek-TM"	m^3	"DP UkrGasTech" LTD, Kiev, Ukraine	Metering system for natural gas consumption measurement	1-1721	for 10-100 % ± 0.35% for 1-10 % ± 0.50%	06/04/2012	06/04/2014	Natural gas consumption by the heat generator of the coal mill and the kiln
EL1	"ACE 6000"	MWh	Itron (Actaris), France	Multifunctional Electronic Electricity Meter	50065369	1.0	II/2010	II /2016	Raw materials conveying Substation 22A Input 1 Cell 106
EL2	"ACE 6000"	MWh	Itron (Actaris), France	Multifunctional Electronic Electricity Meter	50065379	1.0	II/2010	II/2016	Raw materials conveying Substation 22A Input 2 Cell 202
EL3	"ACE 6000"	MWh	Itron (Actaris), France	Multifunctional Electronic Electricity Meter	50065516	1.0	III/2010	III/2016	Raw mill Substation 22B Input 1 Cell 105

[4] The natural gas volume for all devices is provided as of 20°C temperature and 101325 Pa absolute pressure.

EL4	"ACE 6000"	MWh	Itron (Actaris), France	Multifunctional Electronic Electricity Meter	50065507	1.0	III/2010	III/2016	Raw mill Substation 22B Input 2 Cell 203
EL5	"ACE 6000"	MWh	Itron (Actaris), France	Multifunctional Electronic Electricity Meter	50065525	1.0	III/2010	III/2016	Kiln Substation 22C Input 1 Cell 104
EL6	"ACE 6000"	MWh	Itron (Actaris), France	Multifunctional Electronic Electricity Meter	50065506	1.0	III/2010	III/2016	Kiln Substation 22C Input 2 Cell 402
EL7	"ACE 6000"	MWh	Itron (Actaris), France	Multifunctional Electronic Electricity Meter	50065509	1.0	III/2010	III/2016	Clinker cooling Substation 22D Input 1 Cell 306
EL8	"ACE 6000"	MWh	Itron (Actaris), France	Multifunctional Electronic Electricity Meter	50065511	1.0	III/2010	III/2016	Clinker cooling Substation 22D Input 2 Cell 204
EL9	"ACE 6000"	MWh	Itron (Actaris), France	Multifunctional Electronic Electricity Meter	50065426	1.0	I/2010	I/2016	Coal mill Substation 22F Input 1 Cell 302
EL10	"ACE 6000"	MWh	Itron (Actaris), France	Multifunctional Electronic Electricity Meter	50065429	1.0	I/2010	I/2016	Coal mill Substation 22F Input 2 Cell 406
BS1	"Gravit 100"	t	Hasler, Germany	Weigh Belt Feeder	5D0371.51	$\pm$ 0,5 %	Calibration is performed by plant personnel in accordance with the calibration instruction issued by the manufacturer. Calibration frequency is usually once per shift (12		Coaldust feeders
BS2	"Gravit 100"	t	Hasler, Germany	Weigh Belt Feeder	5D0371.52	$\pm$ 0,5 %			Coaldust feeders

RM1	"FlowMeter"	t	Hasler, Germany	Raw meal feeder	AD0561.51	± 0,5 %	hours)	Raw meal feeder

Table 3: Equipment used for monitoring activities

Calibration dates are provided in following formats:

- DD/MM/YYYY – exact date;
- MM/YYYY – month of the year in which calibration should be performed;
- QQ/YYYY – quarter of the year in which calibration should be performed.

Calibration of the metering devices and equipment has been conducted on a periodic basis according to the procedures of the Host Party and internal company policies.

B.1.3. Calibration procedures:

For natural gas meters:

QA/QC procedures	Body responsible for calibration and certification
Calibration interval for the electricity meters is: For "FlouTek-TM-1-3" – two years. For "TERZ 94" – two years. Regular cross-checks with the natural gas supply company.	Calibration will be performed by the authorized representatives of the State Metrological System of Ukraine

For electricity meters:

QA/QC procedures	Body responsible for calibration and certification
Calibration interval for the electricity meters is: For "ACE 6000" – six years. Regular cross-checks with the electricity supply company.	Calibration will be performed by the authorized representatives of the State Metrological System of Ukraine

For proportioning belt scales:

QA/QC procedures	Body responsible for calibration and certification
Calibration for coaldust feeders Gravit 100 is performed regularly Regular cross-checks with the stock survey data.	Plant internal services

For raw meal feeder:

QA/QC procedures	Body responsible for calibration and certification
Calibration for raw meal feeder FlowMeter is performed regularly Regular cross-checks with the stock survey data.	Plant internal services

B.1.4. Involvement of Third Parties:

Authorized representatives of the State Metrological System of Ukraine – calibration/verification of the metering equipment.

B.2.1. Data collection (accumulated data for the whole monitoring period):

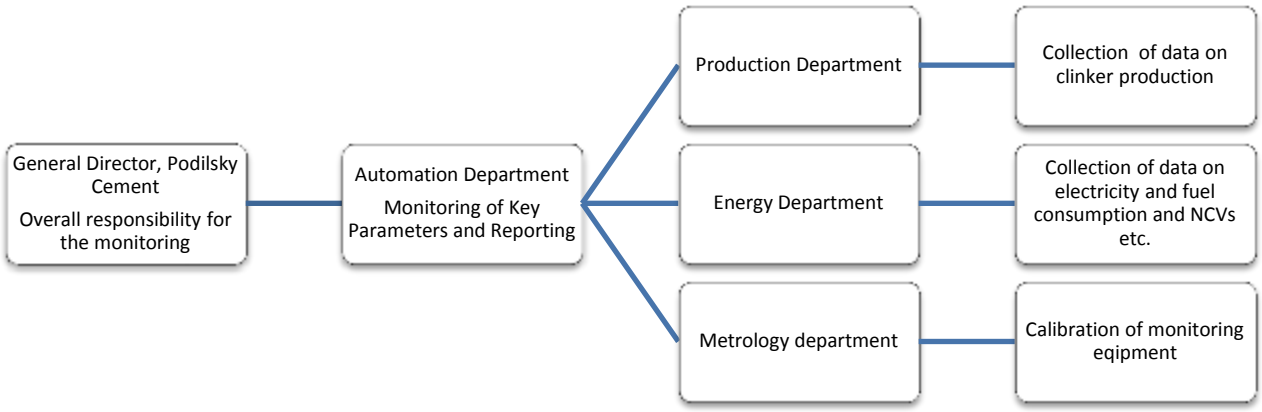

Figure 1: Data collection.

B.2.2. List of fixed default values and ex-ante emission factors:

Data / Parameter	Data unit	Description	Data Source	Value	Uncertainty level of data
EF_{NG}	tCO_2/GJ*	Carbon dioxide emission factor for the combustion of natural gas	IPCC 2006[5]	0.0561	Low
EF_{coal}	tCO_2/GJ**	Carbon dioxide emission factor for the combustion of coal	IPCC 2006[6]	0.0946	Low
BKE	GJ/t (of clinker)	Baseline specific kiln energy consumption	Annex 2 of the PDD Version 2.1 dated 02/02/2007	6.684	Low
$SEC_{BL,rwmkln}$	MWh/t (of clinker)	Baseline specific electricity consumption of raw milling and kiln	Annex 2 of the PDD Version 2.1 dated 02/02/2007	0.0653	Low
$SFC_{BL,NG,heatgen}$	m^3/t (of coal)	Baseline specific natural gas consumption of the coal mill heat generator	See Annex 2 of this report	17.39	Low
$W_{BL,coal}$	fraction	Baseline share of coal in the fuel mix of the kilns	See Annex 2 of this report	0.9939	Low

*56100 $kgCO_2/TJ$ = 0.0561 tCO_2/GJ
**94600 $kgCO_2/TJ$ = 0.0946 tCO_2/GJ
Table 4: Fixed parameters

[5] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion, Page 2.16, Table 2.2.

[6] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion, Page 2.16, Table 2.2. Value for other bituminous coal.

B.2.3. List of variables:
Project emissions variables to be monitored:

Parameter	Calculation method (Measured/Calculated)	Unit	Comment	Meters used (as per B.1.2)	Data aggregation frequency
$EF_{el,y}$ - Indirect specific carbon dioxide emissions from electricity consumption by the 1st class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052, in period y	(C) Calculated by the DFP on the annual basis	tCO_2/MWh	The data will be archived and kept for two years after the last transfer of ERUs from the project.	-	Data are aggregated every year by collecting the publicly available information
$FC_{coal,y}$ - Coal consumption by the kilns in period y	(M/C) Measured continuously by the specialised meters. Summarized monthly by calculation. Direct input from company records and reports.	t	The data will be archived and kept for two years after the last transfer of ERUs from the project.	BS1-2	Data are aggregated monthly. Periodic reports are prepared.
$FC_{NG,y}$ - Natural gas consumption by the kilns in period y	(M/C) Measured continuously by the specialised meters. Summarized monthly by calculation. Direct input from company records and reports.	m^3	The data will be archived and kept for two years after the last transfer of ERUs from the project.	NG1	Data are aggregated monthly. Periodic reports are prepared.
$NCV_{coal,y}$ - Net Calorific Value of coal in period y	(C/E) Calculated/estimated by the plant laboratory.	GJ/t	The data will be archived and kept for two years after the last transfer of ERUs from the project.	-	Data are aggregated monthly. Periodic reports are prepared.
$NCV_{NG,y}$ - Net Calorific Value of natural gas in period y	(C/E) Calculated/estimated by the third party. Accepted in accordance with certificates.	GJ/m^3	The data will be archived and kept for two years after the last transfer of ERUs from the project.	-	Data are aggregated monthly. Periodic reports are prepared.

$EC_{rwmkln,y}$ - Electricity consumption of raw milling and kiln in period y	(M/C) Measured continuously by the specialised meter. Summarized monthly by calculation. Direct input from company record, electricity meters	MWh	The data will be archived and kept for two years after the last transfer of ERUs from the project.	EL1-8[7]	Data are aggregated monthly. Periodic reports are prepared.
$EC_{coalmill,y}$ - Electricity consumption of coal mill in period y	(M/C) Measured continuously by the specialised meter. Summarized monthly by calculation. Direct input from company record, electricity meters	MWh	The data will be archived and kept for two years after the last transfer of ERUs from the project.	EL9-10	Data are aggregated monthly. Periodic reports are prepared.
$FC_{NG,coalmill,y}$ - Natural gas consumption of the coal mill heat generator in period y	(M/C) Measured continuously by the specialised meters. Summarized monthly by calculation. Direct input from company records and reports.	m^3	The data will be archived and kept for two years after the last transfer of ERUs from the project.	NG2	Data are aggregated monthly. Periodic reports are prepared.
$CLNK_y$ - Amount of clinker produced in period y	(C) Calculated continuously by multiplying special transition coefficient by raw meal consumption in the kiln feed management system. Summarized monthly by calculation. Direct input from company records and reports.	t	The data will be archived and kept for two years after the last transfer of ERUs from the project.	RM1	Data are aggregated monthly. Periodic reports are prepared.

Table 5: Monitored project emissions variables

All variables required to calculate baseline emissions are also used to calculate project emissions

[7] Data from the meter and documents of energy supply company provided in kWh are converted into MWh for the monitoring purposes.

B2.4. Data concerning GHG emissions by sources of the project activity and the baseline:

Variable	Description	Units	*January 2012*	*February 2012*	*March 2012*	*April 2012*	*May 2012*	*June 2012*
$EF_{el,y}$	Indirect specific carbon dioxide emissions from electricity consumption by the 1st class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052, in period y	tCO_2/MWh*	1.090	1.090	1.090	1.090	1.090	1.090
$FC_{coal,y}$	Coal consumption by the kilns in period y	t	19 803	10 350	8 905	22 850	13 350	11 925
$FC_{NG,y}$	Natural gas consumption by the kilns in period y	m^3	361 324	1 056 181	297 597	238 076	197 467	96 840
$NCV_{coal,y}$	Net Calorific Value of coal in period y	GJ/t	21.48	21.14	21.29	21.06	21.12	21.14
$NCV_{NG,y}$	Net Calorific Value of natural gas in period y	GJ/m^3	0.03407	0.03399	0.03404	0.03432	0.03450	0.03460
$EC_{rwmkln,y}$	Electricity consumption of raw milling and kiln in period y	MWh	9 906	7 285	5 694	11 260	7 494	6 509
$EC_{coalmill,y}$	Electricity consumption of coal mill in period y	MWh	896	514	396	1 065	521	479
$FC_{NG,heatgen,y}$	Natural gas consumption of the coal mill heat generator in period y	m^3	2 604	9 623	2 437	6 610	3 692	2 715
$CLNK_y$	Amount of clinker produced in period y	t	119 694	54 851	52 853	150 752	88 519	77 457
Variable	**Description**	**Units**	***July 2012***	***August 2012***	***September 2012***	***October 2012***	***November 2012***	***December 2012***
$EF_{el,y}$	Indirect specific carbon dioxide emissions from electricity consumption by the 1st class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from	tCO_2/MWh*	1.090	1.090	1.090	1.090	1.090	1.090

	August 13, 1998 # 1052, in period y							
$FC_{coal,y}$	Coal consumption by the kilns in period y	t	28 290	29 438	29 890	35 245	22 815	1 540
$FC_{NG,y}$	Natural gas consumption by the kilns in period y	m^3	459 547	223 273	217 686	562286	156377	514420
$NCV_{coal,y}$	Net Calorific Value of coal in period y	GJ/t	21.35	22.29	22.29	23.19	23.22	22.71
$NCV_{NG,y}$	Net Calorific Value of natural gas in period y	GJ/m^3	0.03461	0.03459	0.03459	0.03438	0.03420	0.03413
$EC_{rwmkln,y}$	Electricity consumption of raw milling and kiln in period y	MWh	13 263	11 532	12 083	16 678	12 294	2 630
$EC_{coalmill,y}$	Electricity consumption of coal mill in period y	MWh	1 249	1 365	1 295	1 109	586	106
$FC_{NG,heatgen,y}$	Natural gas consumption of the coal mill heat generator in period y	m^3	12 437	196 128	97 835	0	0	19 164
$CLNK_y$	Amount of clinker produced in period y	t	174 804	144 962	160 250	216 570	169 434	10 095

*$kgCO_2/kWh = tCO_2/MWh$

Table 6: Data that were collected in the monitoring of the emission reductions

B.2.5. Data concerning leakage:

Leakage is the net change of anthropogenic emissions by sources and/or removals by sinks of GHGs which occurs outside the project boundary, and that can be measured and are directly attributable to the JI project.

Due to reduced coal consumption, fewer emissions will occur in the coal mining and the transport to the factory. This leakage has not been taken into account for simplification and to be conservative. Other leakage was not identified.

B.2.6. Data concerning environmental impacts:

Atmospheric emissions are the only important source of pollution at Podilsky Cement that has an impact on the local environment. According to the national requirements, atmospheric emissions have to be measured by taking samples on the quarterly basis. Podilsky Cement systematically collects data on the pollutants that have an impact on the local environment. Currently the laboratory of Podilsky Cement is making measurements of the following emissions:

Gaseous pollutants (NO_x & SO_x)

NO_x is formed due to the inevitable oxidation reaction of atmospheric nitrogen at high temperatures in the cement kiln. SO_x emissions in cement production originate mainly from raw material. The sulphur content in the raw materials used at Podilsky Cement is insignificant and SO_x emissions are not observed. Gaseous pollutants are measured by means of stationery gas spectrometers and mobile gas spectrometer. Both gas spectrometers used by the laboratory of Podilsky Cement are monitoring the levels of carbon monoxide, SO_x and NO_x emissions.

Dust emissions

Dust, emitted from cement production processes, is not a toxic substance but is considered a nuisance. The main sources of dust from cement production are the raw materials mill, the kiln, clinker coolers and cement mills. Dust emissions from Podilsky Cement are monitored. The emissions of dust are measured by the laboratory of Podilsky Cement by weighing method. The level of dust is being measured by weighing a filter installed for a certain time in the exhaust air flow. Samples are taken on a quarterly basis.

Dry kiln monitoring

The existing scheme of air pollution measurement is used in the project scenario. In this case, the gaseous pollutants (NO_x and SO_x, if any) will be measured on a real-time basis by the existing gas spectrometer that is installed on the new dry kiln. Dust measurements are made by the plant's laboratory using the weighing method on the quarterly basis.

Cement production has certain impact on the local environment. The current levels of the emissions of the main pollutants (dust, sulphur oxides and nitrogen oxides), are in compliance with the requirements of the plant's operational license.

Types of atmospheric emissions (as described in the operational licence) and relevant measurement techniques are presented below.

B.3. Data processing and archiving:

All data will be archived electronic and paper. Data acquisition and processing procedure for each parameter monitored:

1. **Indirect specific carbon dioxide emissions from electricity consumption**

   This parameter is documented in the best available study at the time of monitoring plan preparation – data of the Designated Focal Point (DFP) of Ukraine. This methodology and the resulting carbon emission factor have been developed by the National Environmental Investment Agency (NEIA) - DFP of Ukraine - for the application in JI projects. Carbon emission factors for the years 2008, 2009, 2010 and 2011 estimate are available[8]. It is established that actual ex-post emission factors will be calculated and published every year for the previous year before the 1st of March. As these data are more recent and detailed it is proposed to utilize it for the purpose of the monitoring. The new emission factors are higher than the one used in the PDD and they influence project emissions. Proposed approach is, therefore, conservative. Source document containing the applicable value is stored electronically and in paper form at the time of monitoring report preparation. The IT and data storage system containing this information at the head office of Podilsky Cement has back-ups and allows for reliable data storage with virtually no chance of data loss.

2. **Coal consumption by the kilns**

   Operational data (in the absence - production reports and commercial data) of the company are used in order to confirm the amount of coal consumption by the kilns. The documents obtained are collected by the automation department on a monthly basis. The paper originals are binded into the special folder. Data on coal consumption are logged into the electronic register that is maintained at the head office of the company. The IT and data storage system containing this information at the head office has back-ups and allows for reliable data storage with virtually no chance of data loss. These reports are kept in electronic form in the IT system of the company and in paper form with signatures of the responsible persons.

3. **Natural gas consumption by the kilns**

   Operational data (in the absence - production reports and commercial data) of the company are used in order to confirm the amount of natural gas consumption by the kilns. The documents obtained are collected by the energy and automation department on a monthly basis. The paper originals are binded into the special folder. Data on natural gas consumption are logged into the electronic register that is maintained at the head office of the company. The IT and data storage system containing this information at the head office has back-ups and allows for reliable data storage with virtually no chance of data loss. These reports are kept in electronic form in the IT system of the company and in paper form with signatures of the responsible persons.

4. **Net Calorific Value (NCV) of coal**

   The laboratory reports (in the absence – supplier statements or certificates) of the company are used in order to confirm the NCV of coal used. The documents obtained are collected by the automation department on a monthly basis. The paper originals are binded into the special folder. Data on coal NCV are logged into the electronic register that is maintained at the head office of the company. The IT and data storage system containing this information at the head office has back-ups and allows for reliable data storage with virtually no chance of data loss. These reports are kept in electronic form in the IT system of the company and in paper form with signatures of the responsible persons.

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

5. Net Calorific Value (NCV) of natural gas

The laboratory reports (in the absence – supplier statements or certificates) of the company are used in order to confirm the NCV of natural gas used. The documents obtained are collected by the automation department on a monthly basis. The paper originals are binded into the special folder. Data on natural gas NCV are logged into the electronic register that is maintained at the head office of the company. The IT and data storage system containing this information at the head office has back-ups and allows for reliable data storage with virtually no chance of data loss. These reports are kept in electronic form in the IT system of the company and in paper form with signatures of the responsible persons.

6. Electricity consumption of raw milling and kiln

The operational data (in the absence – production reports and energy department statements) of the company are used in order to confirm the electricity consumption of raw milling and kiln. The documents obtained are collected by the automation department on a monthly basis. The paper originals are binded into the special folder. Data on electricity consumption of raw milling and kiln are logged into the electronic register that is maintained at the head office of the company. The IT and data storage system containing this information at the head office has back-ups and allows for reliable data storage with virtually no chance of data loss. These reports are kept in electronic form in the IT system of the company and in paper form with signatures of the responsible persons.

7. Electricity consumption of coal mill

The operational data (in the absence – production reports and energy department statements) of the company are used in order to confirm the electricity consumption of coal mill. The documents obtained are collected by the automation department on a monthly basis. The paper originals are binded into the special folder. Data on electricity consumption of coal mill are logged into the electronic register that is maintained at the head office of the company. The IT and data storage system containing this information at the head office has back-ups and allows for reliable data storage with virtually no chance of data loss. These reports are kept in electronic form in the IT system of the company and in paper form with signatures of the responsible persons.

8. Natural gas consumption of the coal mill heat generator

The operational data (in the absence – production reports and energy department statements) of the company are used in order to confirm the natural gas consumption of the coal mill heat generator. The documents obtained are collected by the automation department on a monthly basis. The paper originals are binded into the special folder. Data on natural gas consumption of the coal mill heat generator are logged into the electronic register that is maintained at the head office of the company. The IT and data storage system containing this information at the head office has back-ups and allows for reliable data storage with virtually no chance of data loss. These reports are kept in electronic form in the IT system of the company and in paper form with signatures of the responsible persons.

9. Amount of clinker produced

The operational data (in the absence – production reports, stock survey data) of the company are used in order to confirm the amount of clinker produced. The documents obtained are collected by the automation department on a monthly basis. The paper originals are binded into the special folder. Data on clinker production are logged into the electronic register that is maintained at the head office

of the company. The IT and data storage system containing this information at the head office has back-ups and allows for reliable data storage with virtually no chance of data loss. These reports are kept in electronic form in the IT system of the company and in paper form with signatures of the responsible persons.

B.4. Special event log:

All special and exceptional events (critical equipment failures, reconstruction works, emergencies etc.) are documented by the special notes provided to the management of the company. No such events were observed during the monitoring period.

The nature of the project and underlying operations does not foresee any factors that can cause unintended emissions due to emergencies. Possible emergencies can have impact on the continuation of operations (shutdowns) which could lead to a decreased number of ERUs which is, in turn, conservative.

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 the General Director of the Podilsky Cement through supervising and coordinating activities of his subordinates, such as the head of the automation department, the head of the energy department, the head of the production department, the head of the metrology department etc. On-site day-to-day control of electricity consumption will be implemented by the manager of the production unit who will direct on-duty electrician. During the daytime a group of mechanics responsible for maintenance of all technological and measuring equipment as well as automation tools will be present on-site. Online information will be transmitted to the head of energy department. The head of energy department will collect monthly data on net calorific values of natural gas and coal data from the local gas supplier and other suppliers. The head of the production department will gather monthly data about clinker production. The head of energy department will gather monthly data about electricity and fuel consumption. All this information will be submitted in paper and electronic form monthly to the head of the automation department.

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

C.1.2. Trainings:

The project is utilizing technology that requires skills and knowledge in dry-technology cement plant machinery operation, coal dust fuel preparation technology operation, electric equipment operation etc. This kind of skills and knowledge is available locally through the system of vocational training and higher education. This system is state-supervised in Ukraine. Professionals who graduate from vocational schools receive a standard certificate in the field of their professional study. Only workers with proper training can be allowed to operate industrial equipment like. Management of the project host ensures that personnel of the project have received proper training and are eligible to work with the prescribed equipment.

Key positions requiring deep knowledge and experience in dry-technology cement plant operation will be supported by the international staff recruited from companies of CRH Group.

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

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

C.2. Internal audits and control measures:

Internal cross-checks and audits are performed for all of the data monitored as the raw documents used for monitoring are also used in the commercial dealings of the company. General Director of the company reviews monthly and yearly reports and conducts selective cross-checks with the raw documents.

For the fixed data and ex-ante parameters and factors the quality assurance requires to check that the data were acquired from the reliable (i.e. recognised and/or based on research), verifiable (data are open for access, or are available for the project participants) sources.

C.4. Troubleshooting procedures:

All exceptional and troubleshooting events are documented by internal notes. As the data monitored to calculate emission reductions are also used in the commercial dealings of the company and correlate to the clinker produced no emission reductions can be earned if the plant is not in operation.

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

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

SECTION D. Calculation of GHG emission reductions

D.1. Table providing the formulas used:

Formula number from Revised Monitoring Plan	Formula	Formula description
-	$ER_y = BE_y - PE_y$	Calculation of emission reductions
Equation 6	$BE_y = BE_{kiln,y} + BE_{rwmkln,y} + BE_{coalmill,y} + BE_{heatgen,y}$	Baseline emissions calculation
Equation 7	$BE_{kiln,y} = BKE \times CLNK_y \times EF_{mix}$	Baseline emissions of kiln fuel mix in period y
Equation 8	$EF_{mix} = W_{BL,coal} \times EF_{coal} + (1 - W_{BL,coal}) \times EF_{NG}$	Carbon dioxide emission factor of kiln fuel mix
Equation 9	$BE_{rwmkln,y} = SEC_{BL,rwmkln} \times CLNK_y \times EF_{el,y}$	Baseline emissions from electricity consumption of raw milling and kiln in period y
Equation 10	$BE_{coalmill,y} = \frac{W_{BL,coal} \times BKE \times CLNK_y}{NCV_{coal,y}} \times \frac{EC_{coalmill,y}}{FC_{coal,y}} \times EF_{el,y}$	Baseline emissions of electricity consumption of coal mill in period y
Equation 11	$BE_{heatgen,y} = \frac{W_{BL,coal} \times BKE \times CLNK_y}{NCV_{coal,y}} \times SFC_{BL,NG,heatgen} \times NCV_{NG,y} \times EF_{NG}$	Baseline emissions of natural gas consumption of coal mill heat generator in period y
Equation 1	$PE_y = PE_{kiln,y} + PE_{rwmkln,y} + PE_{coalmill,y} + PE_{heatgen,y}$	Project emissions calculation
Equation 2	$PE_{kiln,y} = EF_{NG} \times FC_{NG,y} \times NCV_{NG,y} + EF_{coal} \times FC_{coal,y} \times NCV_{coal,y}$	Project emissions of kiln fuel mix in period y
Equation 3	$PE_{rwmkln,y} = EF_{el,y} \times EC_{rwmkln,y}$	Project emissions of electricity consumption of raw milling and kiln in period y
Equation 4	$PE_{coalmill,y} = EF_{el,y} \times EC_{coalmill,y}$	Project emissions of electricity consumption of coal mill in period y
Equation 5	$PE_{heatgen,y} = EF_{NG} \times FC_{NG,heatgen,y} \times NCV_{NG,y}$	Project emissions of natural gas consumption of coal mill heat generator in period y

Table 7: Calculation formulas

Parameters in the formulas are as per Sections B.2.1 and B.2.2 of this report.

Additionally in the formulas:

Parameter	Data unit	Description
ER_y	tCO_2e	Emissions reductions of the JI project in period y
BE_y	tCO_2e	Baseline emissions in period y
PE_y	tCO_2e	Project emissions in period y
$PE_{kiln,y}$	tCO_2	Project emissions of kiln fuel mix in period y
$PE_{rwmkln,y}$	tCO_2	Project emissions of electricity consumption of raw milling and kiln in period y
$PE_{coalmill,y}$	tCO_2	Project emissions of electricity consumption of coal mill in period y
$PE_{heatgen,y}$	tCO_2	Project emissions of natural gas consumption of coal mill heat generator in period y.
$BE_{kiln,y}$	tCO_2	Baseline emissions of kiln fuel mix in period y
$BE_{rwmkln,y}$	tCO_2	Baseline emissions from electricity consumption of raw milling and kiln in period y
$BE_{coalmill,y}$	tCO_2	Baseline emissions of electricity consumption of coal mill in period y
$BE_{heatgen,y}$	tCO_2	Baseline emissions of natural gas consumption of coal mill heat generator in period y

Table 8: Parameters in formulas

Results of the emissions calculations above are presented in metric tons of carbon dioxide equivalent (tCO_2e). The metric ton of carbon dioxide equivalent is equal to the metric ton of carbon dioxide (tCO_2). Therefore 1 tCO_2e = 1 tCO_2.

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

All measurement uncertainties and error propagation of the measured parameters are according to the manuals of equipment manufacturers. Uncertainty level of the fixed values and external data is low as they are taken from reliable and publicly available, verifiable sources.

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

D.3.1. Project emissions:

Parameter	**Unit**	***January 2012***	***February 2012***	***March 2012***	***April 2012***	***May 2012***	***June 2012***
Project emissions	tCO_2e	52 710	31 231	25 146	59 429	35 798	31 658
	Unit	***July 2012***	***August 2012***	***September 2012***	***October 2012***	***November 2012***	***December 2012***
	tCO_2e	73 872	76 946	78 221	97 792	64 455	7 313
Total in 2012	tCO_2e	**634 571**					

Table 9: Project emissions

D.3.2. Baseline emissions:

Parameter	**Unit**	***January 2012***	***February 2012***	***March 2012***	***April 2012***	***May 2012***	***June 2012***
Baseline emissions	tCO_2e	87 098	40 018	38 458	109 858	64 275	56 274
	Unit	***July 2012***	***August 2012***	***September 2012***	***October 2012***	***November 2012***	***December 2012***
	tCO_2e	127 193	105 427	116 386	156 273	121 942	7 409
Total in 2012	tCO_2e	**1 030 611**					

Table 10: Baseline emissions

D.3.3. Leakage:

Not Applicable.

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

Parameter	**Unit**	***January 2012***	***February 2012***	***March 2012***	***April 2012***	***May 2012***	***June 2012***
Emission reductions	tCO_2e	34 388	8 787	13 312	50 429	28 477	24 616
	Unit	***July 2012***	***August 2012***	***September 2012***	***October 2012***	***November 2012***	***December 2012***
	tCO_2e	53 321	28 481	38 165	58 481	57 487	96
Total in 2012	tCO_2e	**396 040**					

Table 11: Emission reductions

Annex 1

Definitions and acronyms

Acronyms and Abbreviations

CH_4	METHANE
CO_2	CARBON DIOXIDE
GHG	GREENHOUSE GASES
GWP	GLOBAL WARMING POTENTIAL
IPCC	INTERGOVERMENTAL PANEL ON CLIMATE CHANGE
PDD	PROJECT DESIGN DOCUMENT

Definitions

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.
Emissions reductions	Emissions 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.
Global Warming Potential (GWP)	An index that compares the ability of greenhouse gases to absorb heat in the atmosphere in comparison to carbon dioxide. The index was established by the Intergovernmental Panel of Climate Change.
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 (SF6).
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 emissions reduction or sequestration projects that generate Emissions 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).