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

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

Slag usage and switch from wet to dry process at Yugcement, Ukraine.

Sectoral scope 4: Manufacturing industries[1]

PDD version 5.0 dated 20 September 2010.

A.2. Description of the project:

Cement production is a highly energy intensive process that generates significant emissions of greenhouse gases, in particular CO_2. There are three 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 third source, being smaller as to compare with the first two, is the grid emissions due to electricity consumption of plants motor drives (e.g. kiln rotation, pumping, fans) and other power consumers.

The project aims to significantly decrease the emissions of the first two sources (fossil fuel combustion and calcination) at Yugcement plant factory in Ukraine.

Yugcement is the largest plant of the building materials industry in the south of Ukraine with design production capacity more than 1.25 million tons of cement per year. It uses a wet process and runs two kilns. It was commissioned in the beginning of 1970-s and traditionally serves the southern Ukrainian regions (Mykolayiv, Kherson, Crimea, Odessa).

Kilns installed	Process type	Design clinker capacity, t/h each
#1, 2	Wet	72

Table 1. Existing production capacity

The project foresees the adoption of blast furnace slag (BFS) as decarbonised raw material in the raw meal fed to the kilns. According to the plan, BFS will be added starting from 1 January 2009 on. It is foreseen that the slag addition would be implemented in two steps. Under the fist step some 4% of unground BFS will be added. The second step will follow when all technical issues related to slag adoption will be solved and foresees addition of ground (milled) BFS and increase it's proportion to some 15%. Addition of slag reduces both, the emission due to the calcinations (or decarbonisation) process and fuel consumption. Before the project start slag has not been added to the raw materials for the kilns.

Further on, it is planned to build a new dry kiln and switch from wet to dry process from beginning of 2012. A principle decision on switch from wet to dry, however, is still to be made. So only the slag addition is the subject of this PDD. Should the decision to construct the new kiln to be prior to the end of 2012, the PDD will be amended to include the new data and will be re-determined.

Effect of slag addition occurs due to the following:

[1] http://cdm.unfccc.int/DOE/scopelst.pdf

- less CO_2 is emitted during calcination process in the kiln as slag contains less $CaCO_3$ which decomposes to CaO and CO_2 at high temperature.
- less heat and subsequently less kiln fuel is required for decomposition of limestone in the kiln. Therefore, less CO_2 emissions from fuel combustion occurs.
- Slag reduces the overall moisture content of the slurry therefore less kiln fuel is consumed to evaporate moisture from it. Less CO_2 is emitted from fuel combustion.

This will lead to reduction of emissions as to compare with the situation without project.

The baseline for the project is described in details in section B.1. The baseline has been selected and justified as scenario in which the plant is not using the alternative raw materials for clinker manufacturing.

The project idea first was discussed in 2006.
During 2007 the Project Idea Note was prepared and the letter of endorsement issued by Ukrainian Ministry of Environment in December 2007. See details in section A.5.
The project implementation schedule foresee the preliminary engineering to be completed in the beginning of 2008, all approvals obtained by April 2008 and project implementation first step (addition of 4% slag) in the end of 2008. Further on, approximately in one year additional equipment (mill for slag grinding) to be used. This will allow to increase the slag addition to 15%.

A.3. Project participants:

Party involved	Legal entity project participant (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Ukraine (Host party)	JSC Yugcement	No
Germany	Dyckerhoff AG	No
Netherlands	Global Carbon BV	No

Table 2. Project Participants.

Role of the Project Participants:
- JSC Yugcement is the legal entity operation and owning the cement plant. Yugcement will be implementing the proposed JI project;
- Dyckerhoff AG is the mother company owning JSC Yugcement. Dyckerhoff will provide the financial means for the JI project and will provide the specific technologies;
- Global Carbon BV is responsible for the preparation of the investment as a JI project including PDD preparation, obtaining Party approvals, monitoring and transfer of ERUs;
- The fourth legal entity (not a Project Participant) is Dyckerhoff Ukraine which is the management company of Yugcement.

A.4. Technical description of the project:

A.4.1. Location of the project:

The project is located at village of Olshanske, about 35 km. from Mykolayiv – one of regional centres of Southern Ukraine, 450 km south from Kyiv.

Figure1: Ukraine, the project location and neighbouring countries

A.4.1.1. Host Party(ies):

Ukraine

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

Mykolayiv oblast (region) in the south of Ukraine.

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

Village of Olshanskoye is located about 35 km north-west from Mykolayiv, one of regional centres of Southern Ukraine.

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

Cement factory is located close to main railroad station. The site co-ordinates are: 47°11´ N, 31°47´ E. Own limestone quarries are located 2.5 km from the plant site. The region is rich in mineral resources like limestone and clay, agriculture is developed in the region as well. Mykolayiv, the regional capital is well known as a shipbuilding and export-import trans-shipment centre.

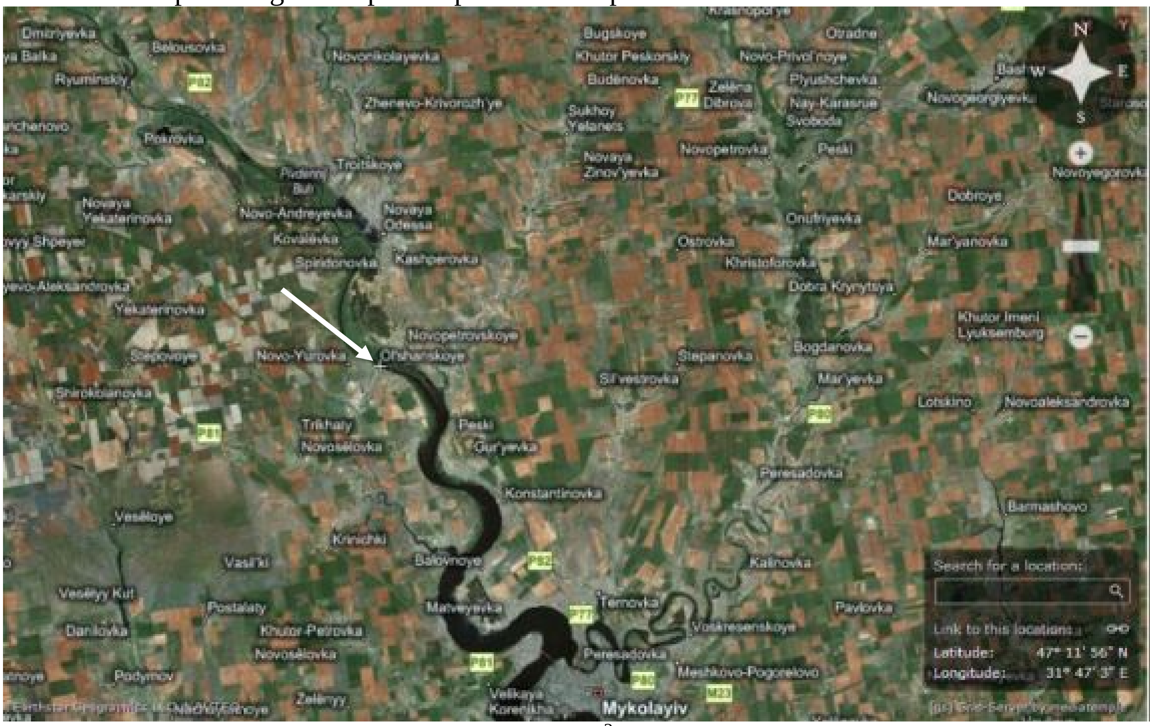

Figure 2: The town of Olshanskoye near Mykolayiv[2].

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

General description of cement production

The cement production cycle can be divided into four steps:

1. Raw materials extraction

The main chemical compounds necessary for cement production are contained in limestone or chalk ($CaCO_3$) and clay or loam (SiO_2, Fe_2O_3 and Al_2O_3). Limestone (or chalk) and clay (or loam) are extracted from natural deposits, crushed and transported to the cement production site.

2. Processing of raw materials

Crushed limestone and clay are mixed in defined proportion in function of raw material content . In the case of wet production technology water is added to form slurry, which is later evaporated in the drying section of the rotary kiln. In the dry process raw materials are mixed, milled and homogenized without adding water. The waste heat from the dry kiln can be used to dry the raw materials on the preparation stage.

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2 Flashearth.com

3. Clinker burning (pyroprocessing)
The raw meal is passed to a rotary kiln. Under the influence of high temperatures, limestone (calcium carbonate) is calcined into lime (calcium oxide) and carbon dioxide:

$$CaCO_3 + heat \Rightarrow CaO + CO_2$$

This chemical reaction is one of the two main sources of carbon dioxide during cement production.
The other main source of CO_2 is fuel burning in order to heat the materials. After the calcination, the calcium oxide reacts with the other chemical compounds present at the temperatures between 1400 – 1450^{o}C. This reaction is called sintering. The final product of these reactions is called clinker. Clinker that comes out of the kiln is cooled and heat returned to the process by clinker coolers.

4. Making cement from clinker
The last stage of cement production is fine crushing of clinker in cement mills to the state of powder. Mineral components (e.g. slag, fly ash, or gypsum) are added to the clinker and milled together in order to produce different types of cement.

Current process layout
The current situation at Yugcement is presented in the figure below. Currently all the existing two wet rotary kilns are in operation, each of them producing about 68 tonnes of clinker/hour. All kilns use natural gas as fuel. Similarly to many of Ukrainian cement plants, the use of coal instead of gas is planned in the nearest future (scheduled from April 2010 onwards).

Figure 3.5 : Production of Cement by the Wet Process

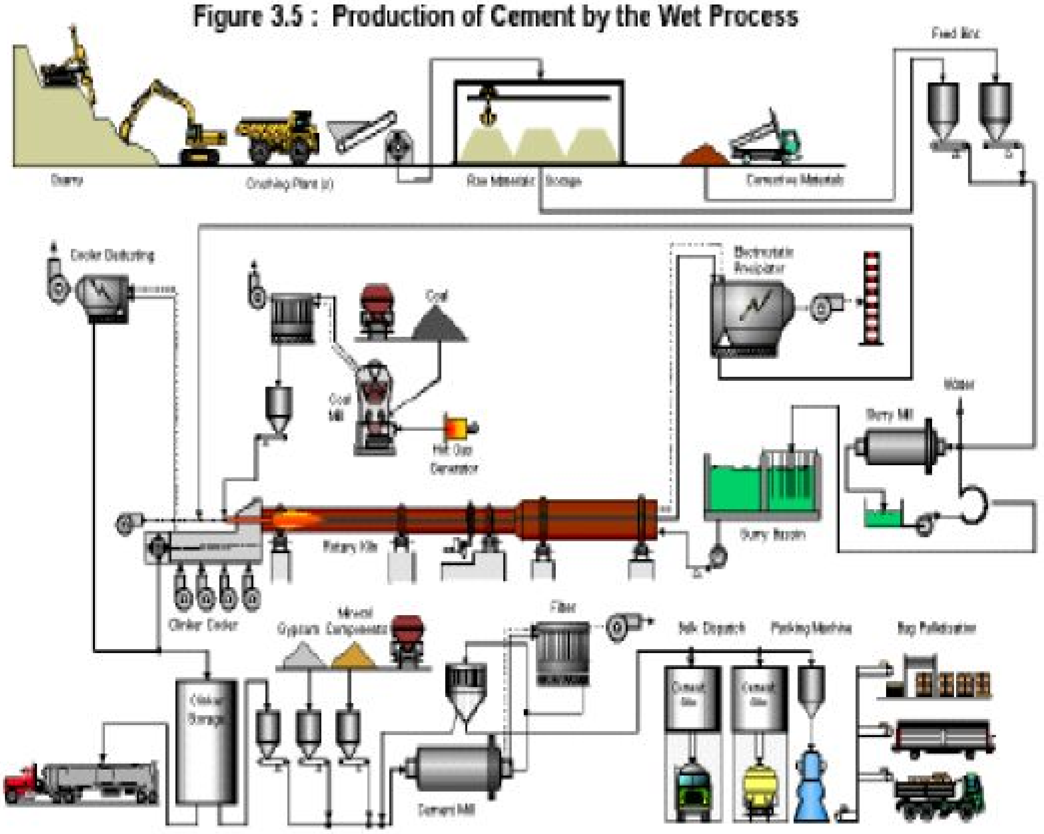

Figure 3: Existing wet cement production process at Yugcement.

Raw materials are individually crushed. They are mixed and milled to slurry with the addition of water in the raw mills. After homogenisation in slurry basins, the kiln feed slurry is fed into rotary wet kilns. de-carbonated materials, like slag is not added to the slurry prior to the project implementation. The first process in the kiln is the evaporation of water. Thereafter, with the mineralogical/chemical reactions of calcination and sintering, clinker is formed. The clinker is then passed to the cooler, and further to cement grinding.

Wet rotary kilns can be operated some 315 to 320 days per year. The total production capacity of the existing installation can be up to approximately 1.1 million tonnes of clinker per year. With existing clinker factor of 0.73 t clinker/t cement the existing capacity can produce up to some 1.5 million tonnes of cement annually (see annex 2). Due to slowdown in the construction sector in Ukraine production volume can drop down to 0.5 million tonnes of clinker per year until the sector recovery.

Technology to be employed for project implementation
To use the slag as partial substitute of raw materials for the first phase of the project (4% slag addition) slag has to be dried prior to admission. For this an existing gas fired drying drum shall be used. A new conveyor to handle the slag needed to be put in operation. To precisely control the amount of slag mixed with slurry the special weight feeders "Shenk"are used (one by each of the two existing kilns). To add higher proportion of slag (15% at the second stage of the project), slag needs to be additionally grinded and a ball mill is being installed.

Situation after project implementation
In the case of proposed JI project BFS will be added to the raw material to replace part of limestone. Addition of slag also requires changes in raw mill composition (proportion of other components, like clay, iron oxide, kaolin and loam will be changed, although not so significant as for limestone). At first stage the BSF will be dried before addition. Gas fired dryer, conveying and feeding equipment will be installed to allow of addition of some 4% of unground slag. At second stage the slag mill and auxiliaries will be installed to grind the slag before addition and slag percentage will be increased to approximately 15%.

Addition of BFS would lead to reduction of kiln fuel consumption to some 1480 kcal/kg of clinker after the first stage is implemented and further reduced to some 1270 kcal/kg of clinker at second stage. Due to this, CO_2 emissions from kiln fuel combustion would decrease. Additional significant decrease of CO_2 emission will be reached due to less calcinations if raw materials in the kiln. It is expected, that addition of BFS would reduce CO_2 from 0.525 to 0.504 after first stage and to 0.44625 tCO_2 per ton of clinker after second stage. Electricity consumption is expected to increase due to additional milling and handling of slag.
The production of clinker will be at the level of 0.5 to 1 million tons a year.
The proposed project foresees application of modern good practice engineering solutions. It would allow usage of slag as raw material and produce clinker of high quality. It is not foreseen to substitute the production equipment with the new one or equipment employing new production process.
The project technology will result in better performance of clinker production process, it will reduce the consumption of natural raw materials due to substitution of them by blast furnace slag.

Fuels in the cement sector
In the former Soviet Union natural gas has been subsidised, allowing cement factories to continue using natural gas whereas in Western Europe coal has been the main source of fuel[3]due to the higher cost of

[3] "Best Available Techniques" for the cement industry, CEMBUREAU, 1999

natural gas. Over past 3 years all the cement plants in the country have been facing an increasing price of natural gas. During 2005-2007 a doubling of gas prices occurred for the industrial consumers and it is very unlikely that gas prices will not only return to previous level, but even stay at the current level[4].

As for January 2008 the cost price of natural gas is close to 100% higher than the cost price of coal. As the fuel cost is an important factor in the production cost of cement, the Board of Dyckerhoff decided in 2007 to install a coal milling and handling system at Yugcement to enable the factory to switch to coal in 2010. The coal mill shall be fully commissioned in spring 2010.

The trend of the price of natural gas is upwards and will, in time, approach a level similar to those of Western and Central Europe. It is therefore unrealistic to assume that Yugcement will continue using natural gas as main kiln fuel after the commissioning of the coal mill (for reference: the conventional fuel in cement factories in Western Europe, USA, China and India is coal). Due to these factors only coal can be regarded as credible type of fuel in both, baseline and project scenarios.

Maintenance of new equipment
Maintenance planning is carried out on the basis of annual schedules of equipment maintenance that are made on the basis of national maintenance standards. Routine maintenance work is done by the qualified personnel of Yugcement. In the case maintenance procedures cannot be done internally, an external company is contracted to do the maintenance work.

The plant provides the external contractor with design and technical documentation, necessary materials and spare parts. The plant is obliged to provide a contractor with compressed air from plant network, oxygen, water, electric power, hoisting machines during preparatory and maintenance work. In case the contractor is using his own energy recourses the plant pays for them according to contractor estimates and prices.

After the final acceptance of the new installation Yugcement is fully responsible for its employees' safety, for proper and safe operation of all power circuits and communications. The contractor is obliged to carry out the maintenance works closely according to design estimates and technical documentation, provided by the plant (maintenance schedule, financial estimates, and drawings). The contracting organization must remove all defects at its own expense in case if maintenance was not fulfilled in compliance with a standard.

Training for the project
The project does not involve fully new technology to Ukraine and therefore extensive training programme is not necessary. Training will be provided by suppliers of equipment once it is installed during and after commissioning. The chosen supplier of the equipment will also be contracted by Dyckerhoff AG to provide additional on-site assistance.

Risks of the project
The risks of the project are summarised in the following table:

Risks	**Mitigation**
1. Financial risk	
The financial performance of the proposed project is	Dyckerhoff AG is willing to provide long-term

[4] http://en.wikipedia.org/wiki/Russia-Ukraine_gas_dispute

not meeting the requirements of the owner, the BFS prices have risen approximately 5 times during 2007 and the growth will most probably continue	financing for the project in case investment criteria are met.
2. Technological risk	
Addition of slag is not a common practice in Ukrainian cement industry. Trials of addition of slag made in 2003 showed it's negative influence on kiln performance.	Dyckerhoff AG has experience within the group of addition of non-carbonated raw material, including slag. It will assist Yugcement in overcoming the technological risk.
3. Market risk	
Yugcement is producing cement for the national market in Ukraine with little export share. Cement production levels are directly related with the market demand. Economic recession might lead to the less production levels than expected.	Conservative market forecasts were taken to estimate production levels during the crediting period.
4. JI approval risk	
There is a risk of no approval of the (JI) project by Ukrainian government as the regular approval procedure may experience changes due to transfer of responsibilities from Ministry of Environment to National Environmental Investment Agency.	Yugcement has held consultations with the authorities on the regional level and also obtained Letter of Endorsement for the project from Ministry of Environment of Ukraine.

Table 3: Summary of project risks

Apart of the significant reduction of emission of GHG-gasses, the project will also decrease the emissions of dust. The effect of the project on the emissions is described in section F.

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

The project will allow to significantly reduce the emissions of CO_2 due to less raw material to be calcinated in the kiln and reduction of kiln fuel consumption as effects of slag addition to the raw mill.

Although addition of slag has some significant advantages, the project faces three important barriers:

Financial and economic barrier
The slag addition project, however being not capital intensive is not profitable without JI revenues.

Lack of experience and technology in Ukraine
Using BFS as part of raw material is not common in Ukrainian cement industry.

Technological risk
Addition of BFS may result in technical problems with the kiln refractory and also negatively influence on the kiln output and availability. Trials were made during 2003-2004 with adoption of unground BFS which were considered unsuccessful and addition of BFS was stopped due to:

- Stacking of slag into feeding line which resulted in unevenness of its addition in the slurry which impacts the clinker composition
- Negative influence on kiln refractory

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

	Years
Length of the period within which emission reduction units are to be earned	4
Length of the crediting period	5
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
Year 2008	0
Year 2009	12,778
Year 2010	17,953
Year 2011	67,324
Year 2012	67,324
Total estimated emission reductions over the period within which emission reduction units are to be earned (tonnes of CO_2 equiv.)	165,378
Total estimated emission reductions over the crediting period (tonnes of CO_2 equiv.)	165,378
Annual average of estimated emission reductions over the crediting period/period within which emission reduction units are to be earned	41,344

Table 4: Estimated amount of emission reduction over the crediting period

Period after 2012 for which emission reductions are estimated	Estimate of annual emission reductions in tones of CO_2 equiv.
Year 2013	120,000
Year 2014	120,000
Year 2015	120,000
Year 2016	120,000
Year 2017	120,000
Year 2018	120,000
Year 2019	120,000
Year 2020	120,000
Year 2021	120,000
Year 2022	120,000
Total estimated emission reductions over the period indicated (tones of CO2 equivalent)	1,200,000
Annual average of estimated emission reductions over the period within 2013-2020 (tones of CO2 equivalent)	120,000

Table 5: Estimated amount of emission reductions generated after the crediting period

A.5. Project approval by the Parties involved:

The Project Idea Note had been submitted for review of the Ministry of Environment of Ukraine. Positive Letter of Endorsement # 12325/11/10-07 was issued 5 December 2007.

After completing the determination by AIE, the project has received Letter of Approval from the National Environmental Investment Agency of Ukraine (#1399/23/7 dated 16/09/2010). Letters of Approval of Germany (dated 16/09/2010) and the Netherlands (dated 07/01/2010) has been obtained as well.

SECTION B. Baseline

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

Any baseline for a JI project has to be set in accordance with Appendix B of the Annex to decision 9/CMP.1 (JI guidelines), and with the "Guidance on criteria for baseline setting and monitoring, version 0.2"[5] developed by the Joint Implementation Supervisory Committee (JISC) (hereinafter referred to as "Guidance").

For the cement industry four approved methodologies exist being ACM0003, ACM0005, AM0024 and "Consolidated baseline and monitoring methodology for project activities using alternative raw materials that do not contain carbonates for clinker manufacturing in cement kilns" ACM0015.

None of these methodologies can be applied directly to the project, but these methodologies have been carefully studied to identify the main principles underlying the approach to baseline setting, additionality and monitoring.

A JI specific approach regarding baseline setting and monitoring has been developed in accordance with Appendix B of the JI Guidelines and with the JISC Guidance. This specific approach is based on selected elements of the ACM0015.

Finally, for proving the additionality of the project the most recent "Tool for the demonstration and assessment of additionality (version 05.2)" has been applied. Please refer to section B.2.

While identifying the baseline and project emissions, the general principles of appendix B of the JI guidelines (in particular: project-specific approach, taking conservative assumption, and taking into account relevant policies) have been adhered to.

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

The baseline is the scenario that reasonably represents the anthropogenic emission by source of greenhouse gases that would in absence of the proposed project[6]. As a first step a list of plausible future scenarios are identified and listed (article 21 (b) of the Guidance). The proposed project, not developed as a JI project, has been included as an alternative as well as a continuation of the current practice. These alternatives are assessed whether or not these alternatives are credible and plausible. The consistency between the baseline scenario determination and additionality determination has been checked.

In accordance with the Article 20 of JISC Guidance, option B for establishment of the baseline is selected:

(b) Alternatively, the project participants may establish a baseline that is in accordance with appendix B of the JI guidelines. In doing so, selected elements or combinations of approved CDM baseline and monitoring methodologies or approved CDM methodological tools may be used, as appropriate.[7]

Taking into account the JI specific approach selected for baseline establishment above, in accordance with the Article 21 of JISC Guidance, baseline will be identified according to option B of this article:

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[5] http://ji.unfccc.int/Ref/Guida.html

[6] JI guidelines, appendix B

[7] *Guidance For Criteria On Baseline Setting And Monitoring*, Joint Implementation Supervisory Committee, Article 20 (b)

(b) By identifying and listing plausible future scenarios on the basis of conservative assumptions and identifying the most plausible one.[8]

The approach described above has been used to identify the baseline scenario for Yugcement.

The most plausible future scenario will be identified by checking that all alternatives are consistent with mandatory applicable laws and regulations and by performing a barrier analysis. Should only two alternatives remain, of which one alternative should represent the project scenario with the JI incentive, the CDM Tool "Tool for the demonstration and assessment of additionality" shall be used to prove that the project scenario cannot regarded at the most plausible one.

Uncertainty is taken into account by using the IPCC default factors for CEF of fuels used and usage of standardised CEF of Ukrainian grid.

Step 2. Application of the approach chosen

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

To identify all realistic and plausible alternatives, all options which are consistent with current laws and regulations were regarded. According to ACM0015, at least the following scenarios have to be considered:

- The continuation of the current practice, i.e. a scenario in which the company continues cement production using the existing technology, fuel materials and raw materials;
- A scenario in which traditional raw materials, limestone and clay, are partially substituted by AMC[9] at a different rate than that of the project scenario. If relevant, different scenarios varying the degrees of different raw materials has to be developed;
- The proposed project activity not undertaken as JI project.

At Yugcement several options for substitution of traditional raw materials are technically feasible and are discussed below. The plant can use granulated blast furnace slag (further referred as slag) as partial substitute of natural raw materials. This material is also used as standard additive to cement in the industry.

1. Using no slag in raw material mix which represents continuation of existing situation
2. Using 4% unground slag
3. Using 15% unground slag
4. Using 4% ground (milled) slag
5. Using 15% ground (milled) slag

The five alternatives are described below in more detail

1) Production of clinker without slag addition

Yugcement started producing cement by applying traditional raw material mix since the very beginning in the 1970-s. The wet process was the predominant technology that was implemented in the Soviet Union. The main reason to use a traditional wet process was the ease in raw material handling and to control the quality of the cement. Second important reason was the natural moisture of raw materials which reaches 24%. Energy efficiency was not considered to be high priority at that time.

Slag would not be added to the raw material mix.

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[8] *Guidance For Criteria On Baseline Setting And Monitoring*, Joint Implementation Supervisory Committee, Article 21 (b)

[9] Alternative raw materials for clinker manufacturing that do not contain carbonates

The two existing kilns can be operated at least till 2012.The clinker production, given all the existing kilns will be operated as they do now, could be up to 1.1 million ton a year.

This scenario constitutes of continuation of the current situation at Yugcement.

2) Production of clinker adding 4% of unground slag to the raw mix

Slag would be added to raw material mix for all kilns at a level of approximately 4%. The incentive for slag addition is the reduction of fuel consumption at the existing kilns due to lower calcinations of raw materials in the kiln. The slag would be dried but not milled prior to addition.
To secure the uniform and uninterrupted feeding of slag special dosing equipment would be installed which would allow controlling the ratio of slag in the slurry. As slag has different chemical composition than that of traditional raw material mix, it would be necessary to change the proportion of other raw materials for clinker kilns.

The two existing kilns can be operated at least till 2012.The clinker production, given all the existing kilns will be operated as they do now, could be up to 1.1 million ton a year.

3) Production of clinker adding 15% of unground slag to the raw mix

Similarly to Alternative 2 above, the clinker production will use all existing wet kilns. Unground BFS would be added to raw material mix in bigger volumes of approximately 15%. The incentive for this alternative is the reduction of fuel consumption at the existing kilns due to lower calcinations of raw materials in the kiln. Similarly to alternative 2 above, the proportion of other raw materials would be changed to adopt the slag.

Similarly to alternative 1 above the slag dosing equipment would be installed.

4) Production of clinker adding 4% of ground slag to the raw mix

Similarly to the alternatives above, the clinker production will use all existing wet kilns. BFS being additionally ground in a mill would be added to raw material mix at approximately 4% level. For that special slag mill and auxiliary equipment would be installed. Milling of slag allows for better mixing it with raw materials and better clinker quality. The incentive for this alternative is the reduction of fuel consumption at the existing kilns due to lower calcinations of raw materials in the kiln.

5) Production of clinker adding 15% of ground slag to the raw mix

Similarly to the alternatives above, the clinker production will use all existing wet kilns. BFS ground in a mill would be added to raw material mix at a higher proportion of approximately 15% level. The incentive for this alternative is the reduction of fuel consumption at the existing kilns due to lower calcinations of raw materials in the kiln.

This Alternative represents the proposed JI project in which Yugcement would introduce the addition of slag. It does not take any JI incentive (transferring ERUs) into account. The required investment would be approximately 2.5 million Euro. It consists of two parts. The first part of approximately 1 million Euro is required to install and commission slag drying and dosing equipment as a first stage of the project. This would allow start adding BFS from 0% to some 4% and adopt the technology. The second part of approximately 1.5 million Euro is required to install and commission slag milling equipment. It would allow further increase of slag proportion to some 15%. This alternative would become possible with completion of installation of slag drying, dosing, preparation and handling equipment and following adjustment during first half of 2008 and expected start from in 2009.

Sub step 2b. Consistency with mandatory applicable laws and regulationi

Existing Ukrainian laws and regulations does not force or require the usage of AMC in clinker manufacturing. No industrial policy exists which regulates usage of slag as raw material for cement manufacture.
Therefore, it can be considered that all listed alternatives do not contradict existing laws and regulations.

Sub step 2c. Barrier analysis

Not applicable.

Assessment of the alternative scenarios
Yugcement is producing cement for the Ukrainian market. Within this market Yugcement should work within the following constraints:

- The cement market is a competitive market;
- The factory should meet the quality requirements of its clients;
- The factory should be able to meet the growing demand for cement on the Ukrainian market;
- And the factory should be profitable at the same time.

Yugcement started producing cement by applying a wet process since the very beginning. The wet process was the predominant technology that was implemented in the Soviet Union. The main reason to use a wet process was the ease in raw material handling and to control the quality of the cement. Second important reason was the natural moisture of raw materials which reaches 24%. Energy efficiency, nor CO_2 emissions, was not considered to be high priority at that time.

All the two existing kilns can be operated at least till 2012.The clinker production, given all the existing kilns will be operated as they do now, will be up to approximately 1.1 million ton a year.

Assessment of alternative 1: Production of clinker without slag addition and using existing wet process
The wet process is the predominant cement making technology in Ukraine and Yugcement can continue to use the wet process. Slag addition is also not common to most of plants. There are no legal or other requirements which would enforce Yugcement to discontinue using wet production process or add slag into raw mix. The existing kilns can continue operation till at least 2012. This alternative constitute in continuation of existing situation at Yugcement, it is a reasonable and feasible alternative.

Assessment of alternative 2: Production of clinker adding 4% of unground slag to the raw mix and using existing wet process
Similarly to Alternative 1, Yugcement could continue producing clinker at the existing facilities and start using slag as a part of raw mix in some 4% proportion. The trials made during 2004 with adoption of unground blast furnace slag of 2-4% proportion were however not successful. Moreover, as described in section B2 this alternative is not an economic attractive course of action.

Assessment of alternative 3: Production of clinker adding 15% of slag to the raw mix and using existing wet process.
Increasing significantly the proportion of unground slag could face difficulties (see A.4.3.). Also very important is the weak financial performance of slag addition due to rise of blast furnace slag cost

happened during 2007. Please, refer to section B2 where the proof of non-profitability of slag increase is provided. Hence, the alternative 3 is not reasonable.

Assessment of alternative 4: Production of clinker adding 4% of ground slag to the raw mix and using existing wet process
Yugcement could continue producing clinker at the existing facilities and start using prepared (ground) slag as a part of raw mix in some 4% proportion. As described in section B2, addition of unground slag is not profitable. Grinding the slag will increase its cost at the kiln due to additional electricity cost for milling and therefore will make the slag addition more expensive. From this point of view, Alternative 4 is not feasible to undertake.

Assessment of alternative 5: Production of clinker adding 15% of ground slag to the raw material mix
This Alternative represents the proposed JI project in which Yugcement would start adding prepared (ground) slag into approximately 15% proportion to the raw mix. This alternative would start in January 2009 by means of adding some 4% of unground slag and would become fully possible in 2009 with the increase of slag addition to 15% of ground slag. However this Alternative is realistic, in section B.2 it is proven that this Alternative is not an economically attractive course of action.

Sub step 2d. Baseline identification

Only Alternatives 1 and 5 are realistic and credible alternatives. In accordance with many CDM methodologies, "when more than one credible and plausible alternative remains, as a conservative consumption, use the alternative baseline scenario that results in the lowest baseline emissions as the most likely baseline scenario"[10].

Alternative 1 is the remaining realistic and credible alternative with the lowest emissions and is identified as the baseline scenario.

Demonstration of additionality

Please, refer to section B.2 where the additionality has been assessed.

Baseline Emissions

The baseline emissions are established as follows:

1. Emission sources in the baseline are: calcination; combustion of fuel in the kiln; consumption of electricity for raw mill preparation, kiln operation, fuel preparation and feeding; consumption of additional fuel for drying of raw meal or fuel drying (e.g. if coal is used);
2. The baseline emission due to the kiln fuel combustion is based on a three years average kiln efficiency and the carbon emission factor of the (or mix of) fuel used in the project scenario. This approach is identical to the approach used in the project JI0001 "Switch from wet-to-dry process at Podilsky Cement" which determination was made final;
3. Similarly to the approach used in the project JI0001, baseline setting of AMC percentage and non-carbonated CaO and MgO contents in the raw mill and clinker by fixing the average content of these oxides in slurry (raw mix) and clinker;
4. Clinker and raw mix volumes were set in a similar way to ACM0015;
5. The baseline emissions of the grid are established using the Ukrainian standardized grid factor as mentioned in Annex 2;

[10] AM0040, page 5.

The following assumptions were made in order to elaborate the baseline:

- The emissions at the quarry would remain the same. Actually, substitution of quarried raw materials by AMC would lead to fewer raw materials quarried. Not taking this reduction into account is conservative;
- The technical life time of the existing kiln extends to at least the end of the crediting period;

Theoretical description of the approach chosen for calculation of emissions in the baseline scenario.

The emissions in the baseline scenario occur due to three main sources:

- Calcination of the natural raw materials containing calcium and magnesium carbonates with release of CO_2. To calculate the emissions due to calcinations of raw materials the formulae proposed in ACM0015 is used.
- Emission due to combustion of fossil fuels in the kiln;
- Indirect emissions due to power consumption from the grid (including the consumption for fuel preparation, if any);
- Supplementary fuel consumption for fuel preparation.

The following assumptions are made to calculate the emissions in the baseline:

1. The amount of clinker is the same in both baseline and project scenario;
2. Same fuel type(-s) and their proportion are used in baseline and project scenario;
3. Actual NCV of fuels are used in baseline and project scenario.
4. The cement kiln dust (CKD) is being recycled except for the small portion being not captured by kiln flue gas de-dusting units and therefore the emissions due to discarded CKD are not taken into account.

To calculate the emissions in the baseline the following formulae are used:

$$BE_y = BE_{Calcin} + BE_{FC} + BE_{EL,} + BE_{Coal,y} \qquad (1)$$

Where:

BE_y	is the baseline emissions for the year y (tCO_2)
BE_{Calcin}	is the baseline CO_2 emissions from calcinations of calcium carbonate and magnesium carbonate contained in the raw materials during burning in the clinker kiln (tCO_2)
BE_{FC}	is the baseline emissions due to kiln fuel combustion (tCO_2)
BE_{dry}	is the baseline emissions due to additional fuel consumption for raw materials or fuel drying, (tCO_2)
BE_{EL_grid}	is the baseline emissions due to grid electricity consumption (tCO_2)

Baseline emission from calcination

In order to calculate the baseline emission from calcination the non-carbonated content of calcium and magnesium oxides in the clinker and in the raw mill (slurry).

$$BE_{Calcin} = \begin{pmatrix} 0.785 \times \left(CaO_{CLNK\_Bsl} \times CLNK_y - CaO_{RM\_Bsl} \times RM_y\right) + \\ +1.092 \times \left(MgO_{CLNK\_Bsl} \times CLNK_y - MgO_{RM\_Bsa} \times RM_y\right) \end{pmatrix} \qquad (2)$$

Where:

BE_{Calcin}	is the baseline CO_2 emission from calcinations of calcium carbonate and magnesium carbonate (tCO2)
0.785	is the stoichiometric emission factor for CaO (tCO2/tCaO)
1.092	is the stoichiometric emission factor for MgO(tCO2/tMgO)
CaO_{CLNK_Bsl}	is the non-carbonate CaO content in clinker in baseline (tonnes of CaO/tonne of clinker)
CaO_{RM_Bsl}	is the non-carbonate CaO content in raw meal in baseline (tonnes of CaO/tonne of raw meal)
MgO_{CLNK_Bsl}	is the non-carbonate MgO content in clinker in baseline (tonnes of MgO/tonne of clinker)
MgO_{RM_Bsl}	is the non-carbonate MgO content in raw meal in baseline (tonnes of MgO/ tonne of raw meal)
$ClNK_y$	is the actual annual production of clinker in the project year y (tonnes)
RM_y	is the annual consumption of raw meal in the baseline (tonnes)

Baseline emissions from combustion of fuels in the kiln

In order to obtain the baseline value of emissions due to combustion of fuel(-s) in the kiln, the historical specific kiln energy consumption values were used

$$BE_{FC} = KE_{BSL} \times \frac{\sum_i \left(FC_{i,y} \times NCV_i \times EF_{CO_2,y}\right)}{\sum_i \left(FC_{i,y} \times NCV_i\right)} \times CLNK_y \qquad (3)$$

Where:

BE_{FC}	is the baseline emissions due to kiln fuel combustion (tCO_2)
KE_{BSL}	is the specific baseline kiln calorific consumption (kiln efficiency) (GJ/t clnk)
$FC_{i,y}$	is the kiln fuel of type i consumption during he year y (tons or thousand Nm^3)
$EF_{CO2,i}$	is the carbon emission factor of fuel of type i (tCO_2/GJ)
NCV_i	is the net (lower) calorific value of fuel of type I (GJ/ton or thousand Nm^3)
$CLNK_y$	is the annual clinker production in year y (tonnes)

Raw meal preparation and kiln electricity consumption baseline

$$BE_{EL,y} = EF_{el} \times EL_{BSl} \times CLNK_y \qquad (4)$$

Where:

$BE_{EL,y}$	is the baseline emission due to electricity consumption for preparation of raw meal and kilns electricity consumption in year y (tCO_2)
EF_{el}	is the carbon emission factor of electricity grid of Ukraine in year y (tCO_2/MWh)
EL_{BSL}	is the average for 3 last years specific electricity consumption of equipment for raw meal preparation and electricity consumption of existing on site wet kilns. See annex 2 (MWh/ton of clinker)
$CLNK_y$	is the production of clinker on wet kilns in year y (tonnes)

Coal preparation baseline

$$BE_{coal,y} = BE_{coal\_EL,y} + BE_{coal\_FC,y} \qquad (5)$$

Where $BE_{coal\_EL,y}$ and $BE_{coal\_FC,y}$ are the baseline emissions due to electricity consumption (for coal milling and conveying) and fuel consumption by heat generator used to dry the coal in year y (tCO_2). They are defined as follows:

In the baseline scenario the coal mill would have to mill more coal than compared to the project scenario for the same amount of clinker produced because of lower kiln efficiencies.

$$BE_{coal\_el,y} = ELSP_{coalmill,y} \times FC_{coal\_BL,y} \times EF_{el,y} \quad (6)$$

Where:

$EF_{el,y}$	is the carbon emission factor of electricity grid of Ukraine in year y (tCO_2/MWh)
$ELSP_{coalmill,y}$	is the specific electricity consumption for coal milling and coal conveying in year y (MWh/ton of coal)
$FC_{coal\_BL,y}$	is the baseline consumption of coal for wet kilns in year y (tonnes)

In the baseline scenario no exhaust gases from the kilns can be used to dry the coal. Similar situation occurs if the fuel switch to coal is made prior to construction of new dry kiln and its start up. Therefore in the baseline scenario a heat generator will be installed. The heat generator will start operating at the same time with the coal mill will be put into operation in the middle of 2009 and will continue operating under baseline scenario. The fuel for heat generator will be either natural gas or coal, or mixture of both. Similar to electricity consumption of coal mill, in the baseline scenario the coal dryer would have to dry more coal than in the project scenario for the same amount of clinker produced. And, therefore, the baseline emissions for heat generator fuel consumption are calculated by monitoring the actual fuel consumption by the heat generator and calculating it's specific fuel consumption as follows:

$$BE_{coal,FC,y} = \sum_i FSP_{heat\_gen,i,y} \times FC_{coal\_BL,y} \times EF_{fuel\_i,y} \quad (7)$$

Where:

$EF_{fuel\_i,y}$	is the emission factor of fuel of type *i* used in heat generator for drying the coal in year y (tCO_2/GJ)
$FC_{coal\_BL,y}$	is the baseline consumption of coal for kilns in year y(tonnes)
$FSP_{coall\_,y}$	is the specific consumption of fuel of type *i* for heat generator drying the coal (GJ/ton of coal)
$FC_{heat\_gen,,y}$	is the fuel consumption for heat generator of coal mill for drying of coal and is defined the following way:

$$FC_{coal\_BL,y} = BKE_{BSL} \times CLNK_y \quad (8)$$

See annex 2 for setting of BKE_{Bsl} , FC_{coal_Bl} ,El_{Bsl}

Data/Parameter	BKE_{BSL}
Data unit	GJ/ton of clinker
Description	Baseline kiln efficiency (baseline kiln economy)
Time of determination/monitoring	Fixed ex-ante as average annual for 2005-2007
Source of data (to be) used	Project owner records
Value of data applied (for ex ante calculations/determinations)	6.08
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measured on site.
OA/QC procedures (to be) applied	According to the project owner policy.
Any comment	GJ/ton of clinker

Data/Parameter	$\mathbf{EL_{Bsl}}$
Data unit	MWh/ton of clinker
Description	Baseline grid electricity specific consumption for clinker production, including consumption of electricity for raw mill preparation, kiln electricity consumption, fuel preparation and feeding.
Time of determination/monitoring	Fixed ex-ante as average annual for 2005-2007
Source of data (to be) used	Project owner records
Value of data applied (for ex ante calculations/determinations)	86.43
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measured on site.
QA/QC procedures (to be) applied	According to the project owner policy.
Any comment	No

Data/Parameter	$\mathbf{CaO_{RM\_Bsl}}$
Data unit	%
Description	Content of non-carbonated CaO in the raw mill in the baseline

Time of determination/monitoring	Fixed ex-ante as average annual for 2005-2007
Source of data (to be) used	Project owner records
Value of data applied (for ex ante calculations/determinations)	0.0
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measured on site.
QA/QC procedures (to be) applied	According to the project owner policy.
Any comment	Natural raw materials used at Yugcement only contain carbonated forms of calcium oxide.

Data/Parameter	**MgO_{RM_Bsl}**
Data unit	%
Description	Content of non-carbonated MgO in the raw mill in the baseline
Time of determination/monitoring	Fixed ex-ante as average annual for 2005-2007
Source of data (to be) used	Project owner records
Value of data applied (for ex ante calculations/determinations)	0.0
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measured on site.
QA/QC procedures (to be) applied	According to the project owner policy.
Any comment	Natural raw materials used at Yugcement only contain carbonated forms of calcium oxide.

Data/Parameter	**CaO_{CLNK_Bsl}**
Data unit	%
Description	Content of CaO in the clinker in the baseline
Time of determination/monitoring	Fixed ex-ante as average annual for 2005-2007
Source of data (to be) used	Project owner records
Value of data applied (for ex ante calculations/determinations)	65.24
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measured on site.
QA/QC procedures (to be) applied	According to the project owner policy.
Any comment	No

Data/Parameter	**MgO_{CLNK_Bsl}**
Data unit	%
Description	Content of non-carbonated MgO in the clinker in the baseline
Time of determination/monitoring	Fixed ex-ante as average annual for 2001-2003
Source of data (to be) used	Project owner records
Value of data applied (for ex ante calculations/determinations)	1.81
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measured on site.
QA/QC procedures (to be) applied	According to the project owner policy.
Any comment	No

Data/Parameter	**$ELSP_{Coalmill, y}$**
Data unit	MWh/ton of coal
Description	Specific power consumption of coal mill
Time of determination/monitoring	Estimated ex-ante based on equipment specs
Source of data (to be) used	Project owner records
Value of data applied (for ex ante calculations/determinations)	0.017
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measured on site.
QA/QC procedures (to be) applied	According to the project owner policy.
Any comment	Actual data will be used during monitoring

Data/Parameter	**$FSP_{heat\_gen, y}$**
Data unit	GJ/ton of coal
Description	Specific fuel consumption of coal mill heat generator for coal drying
Time of determination/monitoring	Estimated ex-ante based on equipment specs
Source of data (to be) used	Project owner records
Value of data applied (for ex ante calculations/determinations)	0.3
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measured on site.
QA/QC procedures (to be) applied	According to the project owner policy.

Any comment	Actual data will be used during monitoring

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

The proposed project activity constitute in partial replacement of natural raw materials traditionally used for clinker manufacturing by alternative raw materials (slag). In order to demonstrate that the project provides reductions in emissions by sources that are additional to any that would otherwise occur the step-wise approach was used as described below:

STEP 1. Indication and description of the approach applied

The latest version of the CDM Executive Board approved "Tool for the demonstration and assessment of additionality" Version 05.2[11] has been applied to show that the reductions of anthropogenic emissions of the greenhouse gases are reduced below those that would have otherwise occurred. This tool has been used in accordance with the JISC Guidance on Criteria for Baseline Setting and Monitoring.

STEP 2. Application of the approach chosen

Step 1. Identification of alternatives to the project activity

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

As described in section B.1 the five alternatives can be identified. Alternatives 1: Continuation of clinker production using traditional natural raw materials and Alternative 5: Proposed project not undertaken as JI was deemed the feasible and credible alternatives.

Outcome of Step 1: At least one realistic and credible alternative scenario to the project activity can be identified which is in compliance with mandatory legislation and regulations taking into account the enforcement in Ukraine.

Step 2. Investment analysis

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

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

The investment analysis has been carried out by the project participants in accordance with the Additionality Tool's Annex: Guidance on the Assessment of Investment Analysis: (Version 02).

Sub-step 2a. Determination of the analysis method

The proposed project generates cost savings, so cost analysis (sub-step 2b Option I) of the Additionality Tool cannot be used.

In line with the CDM Additionality Tool version 05.2 Option III – benchmark analysis – has been chosen. The project participants have chosen to use Project IRR as the assessment indicator. In order to select a

[11] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf Hereinafter referred to as Additionality Tool

proper benchmark for the indicator chosen project participants have assessed options contained in the Additionality Tool.

The 4b approach of the Option III was selected. Project participants have taken project NPV as a benchmark.

Sub-step 2b. Application of the benchmark analysis

The benchmark selected in project NPV. If negative project NPV value is obtained it would mean that the project owner would not consider the investment in the project.
The discount rate for performing the cash flow analysis was calculated using the average loan rate in foreign currency as of 01/01/2008 as reported by National Bank of Ukraine and the 10 years average inflation rate for EuroZone. The cash flow calculation was performed in Euro.

Sub-step 2c. Calculation and comparison of the indicators

The project's cash flow was calculated using the following assumptions:

- The benchmark is the proposed project NPV. The NPV shall be positive for the project owner to make positive investment decision.
- Cash flow calculation was made for the period 2008-2017 (10 years)
- The fair value of project activity assets in 2017 has been applied in the calculations.

The decision to start the project has been made in August 2007. By the end of 2007 the PIN was prepared and Letter of Endorsement has been issued by Ministry of Ecology of Ukraine.

The resulting **Project NPV is negative in the main scenario.** Due to this the project would not have been financially attractive without the JI element.

Sub-step 2d. Sensitivity analysis

The Sensitivity analysis summary is presented below to show the impact of fluctuation of the most important factors.

The following scenarios were considered*:*

Project/Indicator	***NPV, thousands EUR***
Main Scenario	**-5,175.14**
Scenario 1 (coal price +10%; raw materials price +10%; slag price -10%; investment cost -10%)	**-2,592.42**
Scenario 2 (coal price -10%; raw materials price -10%; slag price +10%; investment cost +10%)	**-6,802.58**

Table 6: Scenarios in sensitivity analysis

Scenario 3 represents the most favourable course for this energy and material usage efficiency project.. Even in this case the project NPV stays negative.

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

Step 3: Barrier analysis
Not applicable. Proceeding to Step 4.

Step 4: Common practice analysis
Production of clinker from traditional raw materials being limestone and clay is a predominant practice in the cement industry of Ukraine, and also in neighboring Belarus and Russian Federation. The traditional raw materials are in vast majority of cases available from the quarries located near the cement plants.

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

Among all 12 cement plants producing clinker in Ukraine only one – Dniprocement - has been using AMC in a large share. Dniprocement, being built in 1936, has been operating dry kilns designed to use BFS from adjacent Dneprodzerzhinsk metallurgical plant, does not have limestone quarry from the start of production. The raw mix consists of significant amount of alternative raw materials, mainly GBFS. The kiln at Dniprocement represents a specific kiln for usage of high percentage of non-carbonated materials which otherwise would require large place for disposal. Smaller share of slag is used at Volyn-Cement owned by Dyckerhoff (Buzzi Unicem Group). This project has been registered as JI in 2010.

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

Except for Dniprocement no similar plants can be observed in the region that use non-carbonated raw material in excess of some 4%.
The proposed project differs significantly from similar project observed in the sub-step above.

Due to
i) different kiln system and ii) design raw material mix oriented on locally generated slag usage:
ii) absence of limestone quarry:

Dniprocement case represent an essential distinction from the proposed project activity and therefore can be excluded from the consideration of usage of slag as AMC for clinker production in Ukraine.

Usage of AMC in Ukrainian Cement industry is uncommon. There is no Ukrainian law or regulation in force that requires cement plants to use alternative raw materials, including slag as partial substitute of raw materials for clinker manufacturing.

Therefore, the prevailing practice of usage of natural raw materials and predominant usage of wet kilns without cyclone system in the cement industry of Ukraine represent a barrier to the proposed JI project activity.

Conclusion
The registration of the proposed JI activity would help to overcome the technical barriers and help in bearing financial losses caused by higher slag cost.

Conclusion: the impact of the proposed JI project activity will alleviate financial risks of AMC price increase and will alleviate technological barriers and risks to the project.

This JI project provides a reduction in emissions that is additional to any that would otherwise occur.

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

There are three different sources of GHG emissions while producing cement:

- Fuel combustion;
- Geogenic emission from the calcination (decarbonisation) process;
- GHG emission in the Ukrainian Power grid as a result of electricity consumption.

In the table below an overview of all emission sources in the cement production process are given. The following approach has been used in determining whether they have been included in the project boundary:

- All sources of emissions that are not influenced by the project have been excluded;
- All sources of emissions that are influenced by the project have been included.

No	Source	Gas[12]			Justification/Explanation
1	Change in fuel consumption at the quarry and raw material transport	CO_2	Direct	Excluded	• Fossil fuel consumption will decrease[13]
2	Change in grid electricity consumption at the quarry	CO_2	Indirect	Excluded	• Electricity consumption will decrease[14]
3	Change in grid electricity in the raw material transport:	CO_2	Indirect	Included	• The electricity consumption will decrease • Emissions calculated using standardized electricity baseline Ukraine[15]
4	Change in grid electricity consumption at the raw milling preparation:	CO_2	Indirect	Included	• The electricity consumption will decrease • Emissions calculated using standardized electricity baseline Ukraine[16]
5	Change in electricity consumption of the kiln (e.g. motors for rotation, fans)	CO_2	Indirect	Included	• The electricity consumption will decrease • Emissions calculated using standardized electricity

[12] Only CO_2 emissions are taken into account. CH_4 and N_2O emission reduction are omitted. This is conservative and is in line with all cement CDM methodologies mentioned in section B.1. Please refer also to the general remarks in section D.1.

[13] Raw material extraction will decrease as it will be partially replaced by slag. Therefore, fuel and electricity consumption at the quarry will decrease as well. Not taking the decrease into account is conservative.

[14] Raw material extraction will decrease as it will be partially replaced by slag. Therefore, fuel and electricity consumption at the quarry will decrease as well. Not taking the decrease into account is conservative.

[15] Yugcement does not have on-site power generation facilities.

[16] Yugcement does not have on-site power generation facilities.

					baseline Ukraine
6	Change in fossil fuel combustion in kiln	CO_2	Direct	Included	• The fossil fuel combustions will decrease
7	Change in grid electricity consumption at the coal mill	CO_2	Indirect	Included	• The electricity consumption will decrease • Emissions calculated using standardized electricity baseline Ukraine
8	Fuel combustion to dry the coal	CO_2	Direct	Included	• The fuel consumption will decrease in the project scenario
9	Change in geogenic emission (calcination)	CO_2	Direct	Included	• The specific geogenic emission from calcination will be decreased due to use of slag in raw material.

Table 7: Sources of emissions

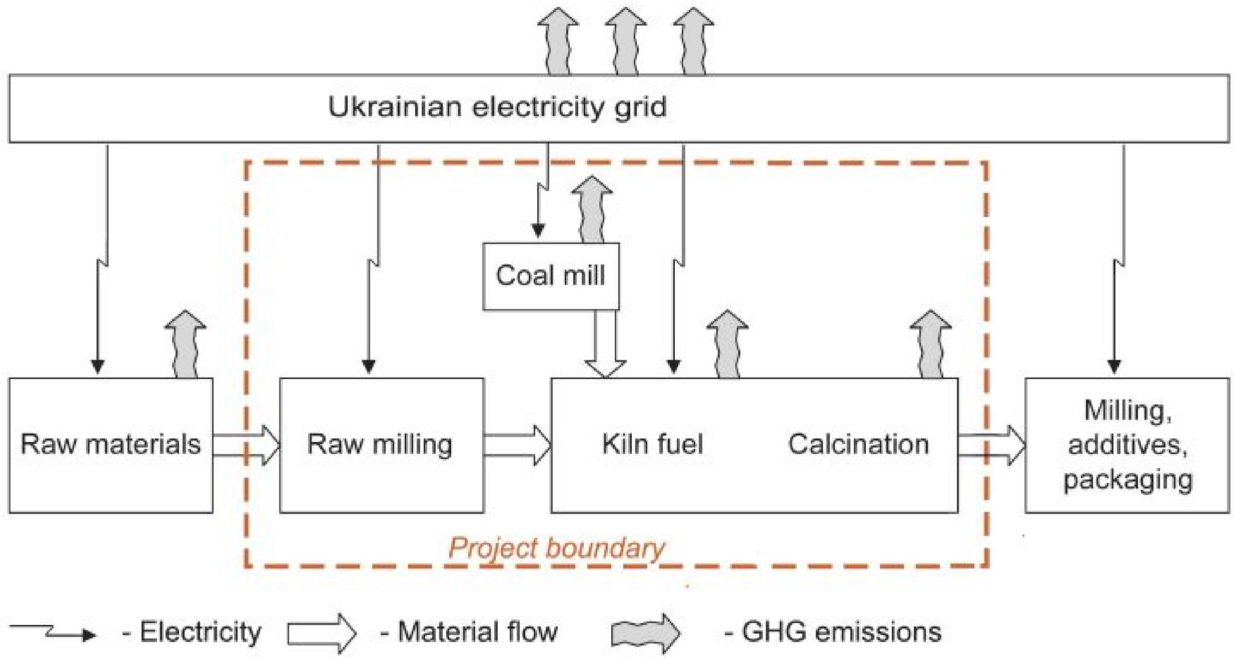

Figure 4: Sources of emissions and project boundary

Please see section E for detailed data of the emissions within the project boundary.

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

Date of completion of the baseline study: 20/09/2010

Name of person/entity setting the baseline:
Global Carbon BV

See annex 1 for detailed contact information.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Date of commissioning: 2008 for increase of slag addition as raw material.

One of the key factors determining the investment decision and, as a consequence, the date of commissioning, is JI project approval. For the purpose of setting the length of the crediting period the most optimistic scenario, being 1 July 2008, has been selected.

C.2. Expected operational lifetime of the project:

At least 25 years or 300 months..

Essentially this is a project for a kiln and raw mill system. The lifetime achieved of such systems is in excess of 30 years, with many examples exceeding even 40 years. Operating kilns within the Dyckerhoff AG group include the following:

Name of Plant	Country	Kiln	Age
Geseke	Germany	Kiln#1	1962
Deuna	Germany	Kiln#2	1976
Göllheim	Germany	Kiln#2	1965
Lengerich	Germany	Kiln#1	1978

Table 8: Some examples of operating dry process kilns within the Dyckerhoff group.

Slag handling and preparation equipment like drying drums, mills and dosing equipment, except for conveyors, can operate at least 25 years.

C.3. Length of the crediting period:

Within the first commitment period:
- Four and a half years (1/7/2008 – 31/12/2012) or 54 months.

Within any relevant agreement under the UNFCCC from 2013 onwards:
- For the duration of the agreement but not more than the remaining operational lifetime of the project (twenty six years)[17]

[17] As discussed by the JISC in its third meeting.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

As elaborated in section B.3 the project activity only affects the emissions related to the kiln fuel, calcination (decarbonisation), 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 a JI specific approach was proposed which foresees:

The baseline emissions are established in the following way:

1. The baseline emission of the kiln fuel over the existing capacity is based on a three years average kiln efficiency and the carbon emission factor of the (mix of) fuel used in the project scenario. This approach is identical to the approach used in the project JI0001 "Switch from wet-to-dry process at Podilsky Cement" which determination was made final;
2. The baseline emission of the calcination component over the existing capacity is based on a three years average of the raw meal prior to project implementation. This approach is identical to the approach used in ACM0015;
3. The baseline emissions of the grid are established using the Ukrainian standardized grid factor as mentioned in annex 2

Assumptions:

- The emissions at the quarry are not influenced by the project;
- The type of fuel combusted in the kiln is not influenced by the project;
- The technical life time of the existing kiln extends to at least the end of the crediting period;
- Under the baseline scenario all existing wet kilns will be operating and will produce at maximum technical capacity;
- No energy efficiency measures will be implemented on the existing wet kilns until the end of the crediting period.

General remarks:

- In consultation with the verifier, the monitoring plan will be updated prior to the commissioning of the project;
- Social indicators such as number of people employed, safety record, training records, etc, will be available to the verifier if required;
- Environmental indicators such as dust emissions, NOx, or SOx will be available to the verifier if required;
- For the greenhouse gas emissions only the CO_2 emissions are taken into account. Cement kilns normally have a CH_4 emission of 0.06 g/kg of clinker and N2O emissions of 0.001 g/kg of clinker compared with more than 650 g CO2 / kg of clinker. Omitting these two emissions for a cement kiln is conservative, because they contribute to less than 0.01% of the total emissions, far below the confidence level for the CO2 data calculations. This is confirmed in the VDZ Environmental Report 2001 (English) and 2004 (German). The CH_4 and N_2O emission reductions will not be claimed. This is conservative.

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

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
P1	PE_y	Plant records	tCO_2	C	Annually	100%	Electronic	
P2	$PE_{calc,y}$	Plant records	tCO_2	C	Annually	100%	Electronic	
P3	$PE_{kiln,y}$	Plant records	tCO_2	C	Annually	100%	Electronic	
P8	$PE_{EL,y}$	Plant records	tCO_2	C	Annually	100%	Electronic	
P9	$PE_{coal,y}$	Plant records	tCO_2	C	Annually	100%	Electronic	
P10	$PE_{coal\_electr,y}$	Plant records	tCO_2	C	Annually	100%	Electronic	
P11	$PE_{coal\_fuel,y}$	Plant records	tCO_2	C	Annually	100%	Electronic	

P12	$PE_{slag,y}$	Plant records	tCO_2	C	Annually	100%	Electronic	
P13	$EF_{el,y}$	Plant records	tCO_2/ MWh	C	Annually	100%	Electronic	Baseline carbon emission factors for JI projects reducing electricity consumption[18]. See annex 2.
P14	$EF_{fuel\_i,y}$	Plant records	tCO_2/ GJ	C	Annually	100%	Electronic	
P15	NCV_{fuel_i}	Plant records	GJ/ton ne	m/c	Per shipment	100%	Electronic	Weighted average of all shipments will be taken over a calendar year for each fuel.
P16	$CLNK_{,y}$	Plant records	tonnes	M	Annually	100%	Electronic	
P17	$CaO_{clnk,y}$	Plant records	%	M	daily	100%	Electronic	Yugcement plant laboratory measurement
P18	$MgO_{clnk,y}$	Plant records	%	M	daily	100%	Electronic	Yugcement plant laboratory measurement
P19	RM_y	Plant records	tonnes	M	Annually	100%	Electronic	
P20	$CaO_{RM,y}$	Plant records	%	M	daily	100%	Electronic	Yugcement plant laboratory measurement
P21	$MgO_{RM,y}$	Plant records	%	M	daily	100%	Electronic	Yugcement plant laboratory measurement

[18] “Operational Guidelines for Project Design Documents of Joint Implementation Projects”, Version 2.3

P22	$FF_{fuel\_i,y}$	Plant records	tonnes	M	continuously	100%	Electronic	The metering of fuel consumption will be designed consistent with the monitoring plan.
P23	$EL_{,y}$	Plant records	MWh	M	Continuously	100%	Electronic	The monitoring of electricity consumption will be designed consistent with the monitoring plan. Calibration frequency will be in accordance with instructions of suppliers.
P24	$EL_{Coalmill,y}$	Plant records	MWh	M	Continuously	100%	Electronic	The monitoring of electricity consumption will be designed consistent with the monitoring plan. Calibration frequency will be in accordance with instructions of suppliers.
P25	$FC_{heat\_gen,y}$	Plant records	GJ	m/c	Continuously	100%	Electronic	Fuel for dryer's heat generator can be both, natural gas or coal
P26	$EL_{slag,y}$	Plant records	MWh	M	Continuously	100%	Electronic	The monitoring of electricity consumption will be designed consistent with the monitoring plan. Calibration frequency will be in accordance with instructions of suppliers.
P27	$FC_{slag,y}$	Plant records	GJ	M	continuously	100%	Electronic	The monitoring of fuel consumption will be designed consistent with the monitoring plan. Calibration frequency of the meter will be in accordance with instructions of suppliers.

Table 9: Data to be collected in order to monitor emissions from the project

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

$$PE_y = PE_{calc,y} + PE_{kiln,y} + PE_{El,y} + PE_{coal,y} + PE_{slag,y} \quad (9)$$

Where:

PE_y Project emission in year y (tCO_2)

$PE_{calc,y}$ Project emission due to calcinations in year y (tCO_2)

$PE_{kiln,y}$ Project emission from combustion of kiln fuels in year y (tCO_2)

$PE_{EL,y}$ Project emission due to fuel and electricity consumption for raw meal preparation (drying, milling, handling) and kiln electricity consumption (tCO_2)

$PE_{coal,y}$ Project emission due to kiln fuel (coal) preparation (grinding, drying, conveying) in year y (tCO_2)

$PE_{slag,y}$ Project emission due to slag preparation in year y (tCO_2)

Calcination

During processing (pyroprocessing) of raw materials mix into a rotary kiln decomposition of limestone at high temperature takes place and CO_2 is released. The amount of CO_2 released is defined as follows:

$$PE_{calc,y} = 0.785(CLNK_y \times CaO_{CLNK,y} - RM_y \times CaO_{RM,y}) + \\ +1.092(CLNK_y \times MgO_{CLNK,y} - RM_y \times MgO_{RM,y}) \quad (10)$$

Where:

0.785	is the stoichiometric emission factor for CaO (tCO2/tCaO)
1.092	is the stoichiometric emission factor for MgO (tCO2/tMgO)
$CaO_{CLNK,y}$	is the non-carbonate CaO content in clinker in % in year y
$CaO_{RM,y}$	is the non-carbonate CaO content in raw meal in % in year y
$MgO_{CLNK,y}$	is the non-carbonate MgO content in clinker in % in year y
$MgO_{RM,y}$	is the non-carbonate MgO content in raw meal in % in year y
CLNK, y	is the annual production of clinker in wet kilns in year y (tonnes)
$RM_{,y}$	is the annual consumption of raw meal of wet kilns in year y (tonnes)

Kiln fuel

There can be different kind of fuels used at the same time; therefore the emissions of each of fuels will be taken into account.

The emissions due to combustion of fuel of type *i* in kilns are defined as follows:

$$PE_{kiln,y} = \sum_{i} FF_{fuel\_i,y} \times EF_{fuel\_i,y} \times NCV_{fuel\_i,y} \qquad (11)$$

Where:

$FF_{fuel\_i,y}$ is the kiln fuel of type *i* consumption in year y (tonnes)
$NCV_{fuel\_i,y}$ is the Net Calorific Value of fuel of type *i* in year y (GJ/ton)
$EF_{fuel\_i, y}$ fuel of type *i* Emission Factor (tCO_2/GJ)

Raw meal preparation and kiln electricity consumption baseline

$$PE_{El,y} = EF_{el,y} \times EL_y \times CLNK_y \qquad (12)$$

Where:

EL_y is the project emission due to electricity consumption for preparation of raw meal and kilns electricity consumption in year y (tCO_2)
$EF_{el, y}$ is the carbon emission factor of electricity grid of Ukraine in year y (tCO_2/MWh)
EL_y is the electricity consumption of equipment for raw meal preparation and electricity consumption of wet kilns. See annex 2. (MWh/ton of clinker)
$CLNK_{,y}$ is the production of clinker in year y (tonnes)

Coal preparation

$$PE_{coal,y} = PE_{coal\_electr,y} + PE_{coal\_fuel,y} \qquad (13)$$

Where $PE_{coal\_electr,y}$ and $PE_{coal\_fuel,y}$ are the project emissions due to electricity consumption for coal milling and conveying and fuel consumption by heat generator used to dry the coal in year y (tCO_2). They are defined as follows:

$$PE_{coal\_electr,y} = EF_{el,y} \times EL_{Coalmill,y} \qquad (14)$$

Where:

$EF_{el, y}$ is the carbon emission factor of electricity grid of Ukraine in year y (tCO_2/MWh)
$EL_{Coalmill\ y}$ is the electricity consumption for coal milling and conveying in year y (MWh)

$$PE_{coal\_fuel,y} = EF_{fuel\_i,y} \times FC_{heat\_gen,y} \qquad (15)$$

Where:

$EF_{fuel\_i,y}$ is the emission factor of fuel of type *i* used in heat generator for drying the coal in year y (tCO_2/GJ)

$FC_{heat\_gen,y}$ is the fuel consumption of heat generator used for drying the coal in year y (GJ)

Slag preparation

The slag preparation and handling require heating and the second stage also grinding which therefore results in additional fuel and electricity consumption

$$PE_{slag,y} = EL_{slag,y} \times EF_{el,y} + FC_{slag,y} \times EF_{fuel\_i} \qquad (16)$$

Where:

$PE_{slag,y}$ is the project emission due to slag preparation in year y (tCO_2)

$EL_{slag,y}$ is the electricity consumption due to slag milling and handling in year y (MWh)

$EF_{el,y}$ is the carbon emission factor of electricity grid of Ukraine in year y (tCO_2/MWh)

$FC_{slag,y}$ is the fuel consumption of slag dryer in year y (GJ)

EF_{fuel_i} is the carbon emission factor of fuel combusted in slag dryer, (tCO_2/GJ)

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
B1	BE_y	Plant records	tCO2	C	annually	100%	electronic	
B2	$BE_{calc,y}$	Plant records	tCO2	C	annually	100%	electronic	

B3	$BE_{FC,y}$	Plant records	tCO2	C	annually	100%	electronic	
B4	$BE_{EL,y}$	Plant records	tCO2	C	annually	100%	electronic	
B5	$BE_{Coal,y}$	Plant records	tCO2	C	annually	100%	electronic	
B6	$BE_{coal\_El, y}$	Plant record	tCO2	C	annually	100%	electronic	
B7	$BE_{coal\_FC, y}$	Plant records	tCO2	C	annually	100%	Electronic	
B8	$CLNK_{,y}$	Plant records	tonnes	C	annually	100%	Electronic	
B9	$CLNK_{CAP}$	Plant records	tonnes	C	annually	100%	Electronic	Maximum capacity of all kilns operating in the baseline scenario, see annex 2.
B10	$RM_{,y}$	Plant records	tonnes	C	annually	100%	Electronic	
B11	KE_{Bsl}	Plant records	GJ/tonne of clinker	m/c	annually	100%	Electronic	This value has been fixed using the average of 2005,2006 and 2007. See annex 2
B12	$EF_{CO2, i}$	Plant records	tCO2/ GJ	m/c	Per shipment	100%	Electronic	Weighted average of all shipments will be taken over a calendar year.
B13	BEL_{RM}	Plant record	MWh/ton of clinker	m/c	annually	100%	Electronic	This value has been fixed using the average of 2005, 2006 and 2007. See annex 2

B14	$ELSP_{coalmill,y}$	Plant record	MWh/ton of coal	C	annually	100%	Electronic	
B15	$FC_{coal\_BL,y}$	Plant record	Tonnes of coal	C	annually	100%	Electronic	
B16	$FSP_{heat\_gen\_i\_PR,y}$	Plant record	GJ/ton of coal	m/c	annually	100%	Electronic	
B17	$EF_{el,y}$	Plant record	tCO2/ MWh	C	Annually	100%	Electronic	Baseline carbon emission factors for JI projects reducing electricity consumption19. See annex 2.

Table 10: Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary

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

As further described in Annex 2

$$BE_y = BE_{Calcin} + BE_{FC} + BE_{EL,} + BE_{Coal,y} \quad (17)$$

Where:

BE_y is the baseline emissions for the year y (tCO_2)

BE_{Calcin} is the baseline CO_2 emissions from calcinations of calcium carbonate and magnesium carbonate contained in the raw materials during burning in the clinker kiln (tCO_2)

BE_{FC} is the baseline emissions due to kiln fuel combustion (tCO_2)

BE_{dry} is the baseline emissions due to additional fuel consumption for raw materials or fuel drying, (tCO_2)

BE_{EL_grid} is the baseline emissions due to grid electricity consumption (tCO_2)

Baseline emission from calcination

[19] "Operational Guidelines for Project Design Documents of Joint Implementation Projects", Version 2.3

In order to calculate the baseline emission from calcination the non-carbonated content of calcium and magnesium oxides in the clinker and in the raw mill (slurry).

$$BE_{Calcin} = \begin{pmatrix} 0.785 \times \left(CaO_{CLNK\_Bsl} \times CLNK_y - CaO_{RM\_Bsl} \times RM_y \right) + \\ +1.092 \times \left(MgO_{CLNK\_Bsl} \times CLNK_y - MgO_{RM\_Bsa} \times RM_y \right) \end{pmatrix} \quad (18)$$

Where:

BE_{Calcin}	is the baseline CO_2 emission from calcinations of calcium carbonate and magnesium carbonate (tCO2)
0.785	is the stoichiometric emission factor for CaO (tCO2/tCaO)
1.092	is the stoichiometric emission factor for MgO(tCO2/tMgO)
CaO_{CLNK_Bsl}	is the non-carbonate CaO content in clinker in baseline (tonnes of CaO/tonne of clinker)
CaO_{RM_Bsl}	is the non-carbonate CaO content in raw meal in baseline (tonnes of CaO/tonne of raw meal)
MgO_{CLNK_Bsl}	is the non-carbonate MgO content in clinker in baseline (tonnes of MgO/tonne of clinker)
MgO_{RM_Bsl}	is the non-carbonate MgO content in raw meal in baseline (tonnes of MgO/ tonne of raw meal)
$ClNK_y$	is the actual annual production of clinker in the project year y (tonnes)
RM_y	is the annual consumption of raw meal in the baseline (tonnes)

Baseline emissions from combustion of fuels in the kiln

In order to obtain the baseline value of emissions due to combustion of fuel(-s) in the kiln, the historical specific kiln energy consumption values were used

$$BE_{FC} = KE_{BSL} \times \frac{\sum_i \left(FC_{i,y} \times NCV_i \times EF_{CO_2,y} \right)}{\sum_i \left(FC_{i,y} \times NCV_i \right)} \times CLNK_y \quad (19)$$

Where:

BE_{FC}	is the baseline emissions due to kiln fuel combustion (tCO_2)
KE_{BSL}	is the specific baseline kiln calorific consumption (kiln efficiency) (GJ/t clnk)
$FC_{i,\,y}$	is the kiln fuel of type i consumption during the year y (tons or thousand Nm^3)
$EF_{CO2,i}$	is the carbon emission factor of fuel of type i (tCO_2/GJ)
NCV_i	is the net (lower) calorific value of fuel of type I (GJ/ton or thousand Nm^3)
$CLNK_y$	is the annual clinker production in year y (tonnes)

Raw meal preparation and kiln electricity consumption baseline

$$BE_{EL,y} = EF_{el} \times EL_{BSl} \times CLNK_{y} \qquad (20)$$

Where:

$BE_{EL,y}$	is the baseline emission due to electricity consumption for preparation of raw meal and kilns electricity consumption in year y (tCO_2)
EF_{el}	is the carbon emission factor of electricity grid of Ukraine in year y (tCO_2/MWh)
EL_{BSL}	is the average for 3 last years specific electricity consumption of equipment for raw meal preparation and electricity consumption of existing on site wet kilns. See annex 2 (MWh/ton of clinker)
$CLNK_{y}$	is the production of clinker on wet kilns in year y (tonnes)

Coal preparation baseline

$$BE_{coal,y} = BE_{coal\_EL,y} + BE_{coal\_FC,y} \qquad (21)$$

Where $BE_{coal\_EL,y}$ and $BE_{coal\_FC,y}$ are the baseline emissions due to electricity consumption (for coal milling and conveying) and fuel consumption by heat generator used to dry the coal in year y (tCO_2). They are defined as follows:

In the baseline scenario the coal mill would have to mill more coal than compared to the project scenario for the same amount of clinker produced because of lower kiln efficiencies.

$$BE_{coal\_el,y} = ELSP_{coalmill,y} \times FC_{coal\_BL,y} \times EF_{el,y} \qquad (22)$$

Where:

$EF_{el,y}$	is the carbon emission factor of electricity grid of Ukraine in year y (tCO_2/MWh)
$ELSP_{coalmill,y}$	is the specific electricity consumption for coal milling and coal conveying in year y (MWh/ton of coal)
$FC_{coal\_BL,y}$	is the baseline consumption of coal for wet kilns in year y (tonnes)

In the baseline scenario no exhaust gases from the kilns can be used to dry the coal. Similar situation occurs if the fuel switch to coal is made prior to construction of new dry kiln and its start up. Therefore in the baseline scenario a heat generator will be installed. The heat generator will start operating at the same time with the coal mill will be put into operation in the middle of 2009 and will continue operating under baseline scenario. The fuel for heat generator will be either natural gas or coal, or mixture of both. Similar to electricity consumption of coal mill, in the baseline scenario the coal dryer would have to dry more coal than in the project scenario for the same amount of clinker produced. And, therefore, the baseline emissions for heat generator fuel consumption are calculated by monitoring the actual fuel consumption by the heat generator and calculating it's specific fuel consumption as follows:

$$BE_{coal,FC,y} = \sum_i FSP_{heat\_gen,i,y} \times FC_{coal\_BL,y} \times EF_{fuel\_i,y} \quad (23)$$

Where:

$EF_{fuel\_i,\ y}$ is the emission factor of fuel of type *i* used in heat generator for drying the coal in year y (tCO_2/GJ)

$FC_{coal\_BL,y}$ is the baseline consumption of coal for kilns in year y(tonnes)

$FSP_{coall\_,y}$ is the specific consumption of fuel of type *i* for heat generator drying the coal (GJ/ton of coal)

$FC_{heat\_gen,,y}$ is the fuel consumption for heat generator of coal mill for drying of coal and is defined the following way:

$$FC_{coal\_BL,y} = BKE_{BSL} \times CLNK_y \quad (24)$$

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

Not applicable.

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

D.1.2.2. Description of formulae used to calculate emission reductions from the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

Not applicable.

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

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

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

Due to reduced coal consumption, fewer emissions will occur in the coal mining and the transport to the plant. This leakages has not been taken into account for simplicity and to be conservative. Other leakages were not identified.

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

$$ER_y = BE_y - PE_y \qquad (25)$$

Where:

ER_y is emission reduction of the JI project in year y (tCO_2e)
BE_y is the baseline emissions in year y (tCO_2e)
PE_y is the project emissions in year y (tCO_2e)

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

Atmospheric emissions are the only important source of pollution at Yugcement that has an impact on the local environment. According to the national requirements, atmospheric emissions have to be measured by making samples on the quarterly basis. Yugcement systematically collects data on the pollutants that have an impact on the local environment. As of November 2007 the environmental laboratory of Yugcement is making measurements of the following emissions:

Gaseous pollutants (NOx & SOx)
Gaseous pollutants are measured by means of a mobile gas spectrometer. It is used to measure the gaseous emissions periodically every three months by taking samples with. Currently there are little emissions of SOx at Yugcement, but the existing gas spectrometers would measure SOx emissions should they appear.

Dust emissions
The emissions of dust are measured by the laboratory of Yugcement using the 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 monthly basis.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
Table 10		
P14 $EF_{fuel\_i,y}$	low	An independent certification company will take samples of coal with frequency defined after the commissioning and

		will issue a certificate of the Net Calorific Value of each shipment. The IPCC default factors then will be used to calculate the EF. The financial department will store these certificates and will calculate the weighted average value of the Carbon Emission Factor (and the Net Calorific Value) at the end of each year. The natural gas supplier's laboratory will carry out measurement of NCV of gas supplied and issue a certificate. The financial department will store these certificates and will calculate the weighted average value of the Carbon Emission Factor (and the Net Calorific Value) at the end of each year.
P15 NCV_{fuel_i}	low	Please, refer to P14
P16 $CLNK_{PR,y}$	medium	Annual sum of daily reports of kiln department. The measurements are based on constant measurement of slurry consumed by each rotary kiln and takes into account composition, moisture content and loss of Ignition (LOI) of slurry. These properties of slurry are tested every 4 hours by laboratory of Yugcement.
P17 $CaO_{clnk,y}$	low	Accredited laboratory of Yugcement is taking samples and conduct the test. The data are archived. Frequency of tests every 4 hours. The laboratory department will calculate the weighted average.
P18 $MgO_{clnk,y}$	low	Accredited laboratory of Yugcement is taking samples and conduct the test. The data are archived. Frequency of tests is every 4 hours. The laboratory department will calculate the weighted average.
P19 $RM_{PR,y}$	medium	Annual sum of daily reports of quarrying and raw material departments. See P23.
P20 $CaO_{RM,y}$	medium	Please refer to P17. Frequency of testing once a day.
P21 $MgO_{RM,y}$	See P18	Please refer to P17. Frequency of testing once a day.
P22 $FF_{fuel\_i,y}$	low	Before each kiln, a coal weighting system will be installed to measure coal consumption of each kiln individually. The coal consumption will be metered and stored in electronic form. Calibration procedure to be done with respect to

		suppliers requirements by an authorized organization.
P23 $EL_{RM,y}$	1% or better	Individual electricity meters will be installed at the raw mill conveying and preparation and kiln system, enabling continuous measurement of the electricity consumption. Electricity meters are calibrated once every 3-6 years depending on the model selected; calibration is done by an authorized organization. The data metered will be supplied by the energy department to the Financial department.
P24 $EL_{mill\&conway,y}$	1% or better	Please refer to P37
P25 $FC_{dryer,y}$	1%	Fuel for heat generator of coal dryer can be both coal or natural gas. Coal consumption to the heat generator will be measured by weighting system. In case of gas consumed as fuel, gas meter will be used. Metered data will be supplied by the energy department to the Financial department.
P26 $EL_{slag,y}$	1%	Individual electricity meters will be installed to measure electricity consumption for slag milling and conveying. Electricity meters are calibrated once every 3-6 years depending on the model selected; calibration is done by an authorized organization. The data metered will be supplied by the energy department to the Financial department.
P27 $FC_{slag,y}$	1%	Fuel for heat generator of slag dryer will be gas. It's consumption to the heat generator will be measured by gas flow meter. Metered data will be supplied by the energy department to the Financial department.
Table 11		
B14 $ELSP_{coalmill\_PR,y}$	1%	The metering system will be designed according to the monitoring plan to allow measurement of electricity consumption of coal milling and conveying and to measure the volume of coal milled. Therefore the specific value can be calculated.
B15 $FSP_{heat\_gen\_PR, y}$	1%	The metering system will be designed according to the monitoring plan to allow measurement of fuel consumed by heat generator of coal mill and to measure the volume of coal milled. Therefore the specific value will be calculated.

Table 11: Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored

Internal quality system at Yugcement

The internal quality system at Yugcement is functioning in accordance with the national standards and regulations in force. The quality of cement, clinker and all raw components is continuously controlled by the laboratory of the plant. The laboratory is certified by the Mykolayiv Regional State Metrology, Standardisation and Accreditation Agency of Ukraine, certificate №PH-0116 /2006.

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

Three departments of Yugcement will be responsible for collecting the information for monitoring purposes.

The laboratory of Yugcement
The laboratory of Yugcement is responsible for quality control of cement, clinker and raw components.

Energy department
The energy department is responsible for control of fuel and electricity consumption at Yugcement. It collects data from the individual electricity meters installed at the production units that consume electricity, and the data of the commercial electricity meter that belongs to the regional power distribution company and measures the overall electricity consumption at the plant. The data from individual electricity meters is cross-checked with the data of the commercial meter. For the purposes of monitoring, the energy department will report electricity consumption level of the kiln system and the raw milling system, and provide it to the financial department.

Financial department
The financial department of is responsible for accounting, controlling and planning/ It will hold the overall responsibility for implementation of the monitoring plan, like organizing and storing the data and calculation the emission reductions. The financial department will also prepare the annual Monitoring Protocols, to be presented to a Verifier of the emission reductions. Other departments of Yugcement will submit relevant data to the financial department for the monitoring purposes. In addition to the preparation of the Annual Monitoring Protocols, the laboratory will conduct an internal audit annually to assess project performance and if necessary make corrective actions.

Apart of internal departments of Yugcement, three independent external organizations will be contracted to provide the data necessary for monitoring plan implementation:

The laboratory of the Mykolayiv regional gas distribution system of
The laboratory will provide data on the net calorific value of the natural gas consumed.

Independent certification body
This body will be contracted by Yugcement to measure the net calorific value of fuel delivered.

Independent surveying company
This company will be contracted if needed, to supervise and approve the in-house survey of the opening (and closing) stocks of coal, cement, clinker, and mineral components.

The data from all external organizations will be collected by the laboratory of Yugcement for monitoring purposes. For the usual routine procedures all the data has to be stored for three years for the purposes of the independent financial audit. For the purpose of the monitoring system implementation, the collected data will be stored by the Laboratory department at least for two years after the end of the crediting period – i.e. at least until 2014. For a detailed description of each measured value, please refer to section D.2.

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

- JSC Yugcement
- Global Carbon B.V.

For contact details refer to annex 1.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Project emissions			2008	2009	2010	2011	2012
1	from calcination	[tCO2/yr]	525,000	252,000	252,000	223,125	223,125
2	from kiln fuel	[tCO2/yr]	340,480	165,082	282,997	258,679	258,679
3	from electricity consumed by kiln and raw material preparation	[tCO2/yr]	77,444	38,722	38,722	38,722	38,722
4	from coal preparation	[tCO2/yr]	0	1,997	3,994	3,651	3,651
5	from slag preparation	[tCO2/yr]	0	884	1,515	5,680	5,680
6	Total	[tCO2/yr]	942,924	458,685	579,228	529,858	529,858
7	Total 2008-2012	[tCO2]	3,040,552				

Table 12: Estimated project emissions

		2013-2022	Total
Estimated project emission after the crediting period	[tCO2/yr]	1,059,715	10,597,150

Table 13: Estimated project emissions after the crediting period

E.2. Estimated leakage:

Project leakage		2008	2009	2010	2011	2012
Leakage	[tCO2/yr]	0	0	0	0	0
Total	[tCO2/yr]	0	0	0	0	0
Total 2008 – 2012	[tCO2]	0				

Table 14: Estimated leakage during the crediting period

		2013-2022	Total
Estimated leakage after the crediting period	[tCO2/yr]	0	0

Table 15: Estimated leakage after the crediting period

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

Project emissions and leakage			2008	2009	2010	2011	2012
1	from calcination	[tCO2/yr]	525,000	252,000	252,000	223,125	223,125
2	from kiln fuel	[tCO2/yr]	340,480	165,082	282,997	258,679	258,679
3	from electricity consumed by kiln and raw material preparation	[tCO2/yr]	77,444	38,722	38,722	38,722	38,722

4	from coal preparation	[tCO2/yr]	0	1,997	3,994	3,651	3,651
5	from slag preparation	[tCO2/yr]	0	884	1,515	5,680	5,680
6	Total	[tCO2/yr]	942,924	458,685	579,228	529,858	529,858
7	Total 2008-2012	[tCO2]	3,040,552				

Table 16: Estimated project emissions and leakage

		2013-2022	Total
Estimated project emission and leakage after the crediting period	[tCO2/yr]	1,059,715	10,597,150

Table 17: Estimated total project emissions and leakage after the crediting period

E.4. Estimated baseline emissions:

Baseline emissions			2008	2009	2010	2011	2012
1	from calcination	[tCO2/yr]	525,000	262,500	262,500	262,500	262,500
2	from kiln fuel	[tCO2/yr]	340,480	170,240	291,840	291,840	291,840
3	from electricity consumed by kiln and raw material preparation	[tCO2/yr]	77,444	38,722	38,722	38,722	38,722
4	from coal preparation	[tCO2/yr]	0	0	4,119	4,119	4,119
5	Total	[tCO2/yr]	942,924	471,462	597,181	597,181	597,181
6	Total 2008-2012	[tCO2]	3,205,930				

Table 18: Estimated baseline emissions

		2013-2022	Total
Estimated baseline emission after the crediting period	[tCO2/yr]	1,194,363	11,943,630

Table 19: Estimated baseline emissions after the crediting period

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

Reductions			2008	2009	2010	2011	2012
	Total	[tCO2/yr]	0	12,778	17,953	67,324	67,324
	Total 2008 - 2012	[tCO2]	165,378				

Table 20: Difference representing the emission reductions of the project

		2013-2022	Total
Emission reduction after the crediting period	[tCO2/yr]	134,648	1,346,480

Table 21: Estimated emission reduction after the crediting period

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

Year	Estimated project emissions (tonnes of	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of	Estimated emission reductions (tonnes of CO_2 equivalent)

	CO_2 equivalent)		CO_2 equivalent)	
Year 2008	942,924	0	942,924	0
Year 2009	458,685	0	471,462	12,778
Year 2010	579,228	0	597,181	17,953
Year 2011	529,858	0	597,181	67,324
Year 2012	529,858	0	597,181	67,324
Total (tonnes of CO_2 equivalent)	3,040,552		3,205,930	165,378

Table 22: Overview of project, baseline, and emission reductions

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
2013-2022	1,059,715	0	1,194,363	134,648
Total (tonnes of CO_2 equivalent.)	10,597,150	0	11,943,630	1,346,480

Table 23: Estimated balance of emissions under the proposed project after the crediting period

Risks and uncertainties

The estimation of the emissions reductions of this project is based on several assumptions. The following factors are of influence of the actual emission reductions. The assumptions are given that have been used for the estimation:

- Commissioning date of the slag subproject first stage is 1/7/2008
- Clinker production will be at the level of 930 kton annually
- Kiln economy of wet kilns is 6.08 GJ/t clinker without addition of slag into raw meal
- Fuel Carbon Emission Factor of coal fuel is 0.096 tCO_2/GJ

The first two assumptions are not within the full control of Yugcement as clinker (cement) production depends on the development of the cement market in Ukraine and the commissioning data depends on obtaining JI approval. The other three factors have a higher certainty.

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts of the project, including transboundary impacts, in accordance with procedures as determined by the host Party:

Cement production has certain impact on the local environment. In Ukraine emission levels in industry are regulated by operating licenses issued by regional offices of the Ministry for Environmental Protection on the individual basis for every enterprise that has significant impact on the 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.

The project foresees introduction of modern auxiliary equipment, designed to meet the strongest pollution restrictions. New burners to be installed having modern control systems will allow to better maintain optimal combustion mode thus contributing to reduction of such pollutants, like CO and NO_x.

Currently the design of the slag addition equipment has been started and will be followed by detailed assessment of environmental impact (OVNS in Ukrainian abbreviation) when complete.

Dust

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 Yugcement are monitored on a regular basis in compliance with norms and regulations in force.

Dust concentration in the exhaust gases is determined on the basis of changes in filter weight measured in a flow of a dust-laden gas for certain period of time. Dust is sampled by gravimetric method in accordance with the national “Methodology of dust concentration measurement in dust-laden process gases”. Accuracy of the measurement is within +/-25%. Testing (calibration) of measurement equipment used to measure dust emissions is carried out once a year by an independent state body (State Organization for Standardization, Metrology and Certification).

Dust emissions are expected not to be influenced by the slag addition project.

Nitrogen and sulphur oxides

NOx is formed due to the inevitable oxidation reaction of the atmospheric nitrogen at high temperatures in the cement kiln. It is expected that after project commissioning the emissions will stay the requirements of the Ukrainian legislation and within the range the Best Available Technology[20] levels of IPPC.

SOx emissions in cement production originate mainly from raw material and also from coal with sulphur content combustion. The sulphur content in the raw materials used at Yugcement is insignificant and SOx emissions are not observed and should not increase after the implementation of the project. However, the gas analyzing equipment of Yugcement will allow monitoring the gaseous emissions of sulphur oxide in case they will appear.

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[20] IPPC Reference Document on Best Available Techniques in the Cement and Lime Manufacturing Industries, December 2001

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to supporting documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The environmental impacts of the project are positive as the project expects to reduce the impact of the existing facility. An Environmental Impact Assessment is not necessary at this stage of project development. The impact on the environment of the project will be assessed by the Ukrainian authorities in the following way.

The environmental impacts will be assessed before obtaining a construction permit. The general principles of evaluating the environmental impact (OVNS, which is the Ukrainian abbreviation) procedure in Ukraine are described by the national laws "On the environmental protection" and "On the environmental expertise". According to the national legislation in force, every project or new activity that can be potentially harmful for the environment, must evaluate the environmental impact[21] [22].

Transboundary effects will be addressed in the environmental impact assessment.

These environmental impacts are analysed after the development of the detailed project design in order to obtain a construction permit. The OVNS document must provide a list of viable project alternatives, a description of the current state of local environment, description of the main pollutants, risk evaluation and an action plan for pollution minimisation. The final OVNS document has to be presented as a separate volume of the project documentation for the evaluation by a state expert company and, optionally may be the subject of public hearing.

The national procedure for receiving the construction permit in general cases is described below.

1. Approval by the local authorities
On the initial stage of the project design preparation Yugcement will conduct consultations with the local authorities, namely the council of town Olshanske and the administration of the Mykolayiv region (oblast). Local authorities will be provided with the general information (the so-called notification on the planned activity) about the envisaged project.

2. Setting requirements for the project
In the case of positive conclusion of the consultations, local authorities will issue approval for developing: a) general project design; b) architectural and planning document; c) terms of reference for the project. These three documents are to contain specific environmental, sanitary, architectural and other requirements for the project.

3. Project design phase
Upon the formulation of the requirements from the local authorities and developing the terms of reference, Yugcement will contract a design institute to prepare the project design documentation package. This package has to include:

- general project description;
- assessment of environmental impact (OVNS);

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[21] The Law of Ukraine "On the environmental expertise", Articles 8, 15, 36

[22] The Law of Ukraine "On the environmental protection", Article 51

- time schedule for the construction works;
- project budget;
- blueprints of the architectural design, general planning and transport.
- Project evaluation

After the preparation of the full project design documentation, as elaborated above, Yugcement will contract an authorized state company to conduct independent evaluation of the project. The evaluation procedure includes receiving of approvals from the following state authorities:

- sanitary authority;
- state authority on environmental protection;
- fire prevention authority;
- energy saving authority;
- labour safety authority.

One of the mandatory parts of the state evaluation procedure is the stakeholder consultation process. All interested parties can submit their comments to the project to the company performing the evaluation process. National regulations do not formulate how the stakeholder consultations have to be held. However, Yugcement is committed to actively publish the information about potential impacts of the project (including the environmental impact) and will take into account the comments from all stakeholders.

4. Construction design
Either after receiving positive conclusion of the state evaluation or in parallel with the evaluation process, Yugcement can start the design of construction documentation. The construction documents shall include construction blueprints, specifications of the equipment and construction materials, construction budget, etc.

5. Receiving the construction permit
The package of construction design documents, project design documentation and positive conclusions of the state evaluation have to be submitted to the local authority on the construction and architecture, which finally issues the construction permit.

The preliminary schedule for the preparation of the project to Ukrainian permitting requirements is as follows:

- Preliminary Discussion with Local Authorities January 2008
- Preliminary Engineering January 2008
- Permit Application Procedure February-March 2008
- Permit Application Evaluation March 2008
- Detailed construction design March-April 2008
- Grant of Permit April 2008
- Construction start expected April 2008

SECTION G. Stakeholders' comments

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

JI projects are not required to go through a (local) stakeholders' consultation. However, Yugcement and Dyckerhoff are planning to present the project to the regional authorities at a later stage. In the course of obtaining the construction permit, Yugcement will actively publish information about the project to stakeholders.

Annex 1

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Annex 2

BASELINE INFORMATION

Capacity of existing wet kilns

Existing wet kilns

Since beginning of 1970s Yugcement operates two wet process rotary kilns. The kilns have design capacity of 72 t clinker/hour each. Wet rotary kilns can be operated some 315 to 320 days per year. The kiln run factor can be within 0.94-0.96. The total production capacity of the existing installation is approximately 1.1 million tonnes of clinker per year ($CLNK_{CAP}$). Over past years, however the utilisation of capacity was lower. The baseline clinker production in year y $CLNK_{BL,y}$ will be equal to the clinker production measured in year y $CLNK_{PR,y}$ with maximum $CLNK_{CAP}$.

Determination of baseline factors

Adoption of BFS into a raw material mix results in reduction of CO_2 emission from calcination and also from kiln fuel combustion for both, wet and dry processes.

Baseline kiln economy of wet kilns

The baseline kiln economy BKE is determined by taking the average of the most recent three years available measurements by the following formula:

$$BKE_{wet} = \sum_{y} \frac{FC_y \times NCV_y}{CLNK_y} \times \frac{1}{3} \tag{26}$$

Where:

BKE_{wet}	Average baseline kiln economy per tonne of clinker (GJ/t clinker)
y	Years 2005, 2006 and 2007
FC,y	Quantity of fossil fuel burnt for clinker production in year y (1000 Nm3)
NCVy	Net calorific value fossil fuel in year y (GJ/1000 Nm3)
CLNKy	Amount of clinker produced in year y (tonne of clinker)

The result is presented below in the table:

Year	2005	2006	2007	Average
Kiln economy (GJ/t clinker)	6.08	6.01	6.15	6.08

Table 24: Measured kiln economy and calculated average

As can be seen in the table above, the kiln economy is rather a stable figure with small fluctuations. Therefore the baseline kiln economy can be established by taking the historic average value of the kiln economy and the BKE_{wet} is taken as 6.08 GJ/tonne of clinker.

Baseline content of CaO and MgO in the raw meal and in the clinker

The content of CaO and MgO in the raw material mix and in the clinker produced has been determined by extrapolating historic measured content.

Year	2005		2006		2007		Average	
	CaO	MgO	CaO	MgO	CaO	MgO	CaO	MgO

Content in raw meal,%	0	0	0	0	0	0	0	0
Content in clinker	64.96	2.09	65.19	2.04	65.56	1.29	65.24	1.81

Table 25: Measured CaO and MgO content

As shown in the table below, the fluctuation of Ca and Mg oxides content in raw meal fluctuates in a narrow range and therefore the average values will be taken as 42.3 % for CaO_{RM_BL} and 1.167 % for MgO_{RM_BL}. Similarly, for the clinker the values are fixed as 65.24 and 1.81%.

Baseline electricity consumption raw milling and kiln drives for wet kilns

The specific electricity consumption of the raw milling and the kiln EL_{Bsl} (MWh/t clinker) has been determined by extrapolating historic measured consumption.

The specific data are presented in a table below.

Year	2005	2006	2007	Average
EL_{Bsl} kWh/t clinker	98	81,3	80	86.43

Table 26: Measured electricity consumption of raw milling and kiln drives and calculated average

The average EL_{Bsl} is 86.43 kWh/t clinker (0.08643 MWh/ton of clinker).

Baseline electricity consumption coal mill

The electricity consumption of the coal mill in the baseline scenario will be calculated as described in section D.1.1.4. For the purpose of estimating the emission reduction potential in section E, the electricity consumption of the coal mill in the baseline scenario has been set at 17 kWh/t coal) or 0.017 MWh/ton coal), based on preliminary equipment specifications.

Baseline specific fuel consumption heat generator coal mill

The specific natural gas consumption of the heat generator $FSP_{coalmil,y}$ (GJ/tonne coal) will be determined by taking actual measurements of operation of the heat generator (since second half of 2009 onwards), after commissioning of the coal mill, and before commissioning of the dry kiln.

For the purpose of estimating the emission reduction potential in section E, the specific fuel consumption $FSP_{coalmill\_y}$ has been set at 0.3 GJ/tonne coal based on 12% coal moisture content assumption.

Baseline electricity factor

The baseline emission factor of the Ukrainian grid $EF_{el,y}$ is taken as 0.896 tCO2 /MWh as set in the standardised baseline factor for Ukrainian electricity grid for JI projects reducing electricity consumption in years 2008-2012 and presented it the document below.

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Choose certainty.
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Ukraine - Assessment of new calculation of CEF

Introduction

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

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

Objective

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

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

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

Scope

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

Date: 17.08.2007

Our reference:
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This document consists of
4 Pages
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origin of the data. The team consists of:

- Werner Betzenbichler (Head of the certification Body "Climate and Energy"),
- Thomas Kleiser (Head of division JI/CDM, GHG-Auditor and Project Manager)
- Markus Knödlseder (GHG-Auditor and Project Manager)

Mr. Kleiser and Betzenbichler assessed the baseline approach and agreed with Global Carbon on the conclusive approach. Mr. Kleiser and Mr. Knödlseder assessed the calculation model whereas Mr. Knödlseder interviewed also Mr. Nikolay Andreevich Borisov, Deputy Director for Strategic Development in Ministry of Fuel and Energy (+380 (44) 2349312 // borisov@mintop.energy.gov.ua) who explained the process of data gathering in the Ukraine. He also confirmed that GlobalCarbon B.V. uses the served data.

Conclusion

The conclusive assessment does not include potential uncertainties that might be occurred in the data gathering process of the ministry. Considering that we confirm that applied data served by Ministry of Fuel and Energy are reliable and correctly used.

Based on submitted calculation method, developed baseline study (see attachment), applied data and written confirmation from Ministry of Fuel and Energy (see attached documents) the team of Carbon Management Service of TÜV SÜD Industrie Service GmbH with its accredited certification body "Climate and Energy" confirms further that developed approach is eligible to determine the Ukrainian electricity grid factor as a standard value for JI project in the Ukraine.

The team recommends updating the calculation annually depending on point of time when national consolidated data are available.

Munich, 17/08/2007

Markus Knödlseder

GHG-Auditor and Project Manager

Munich, 17/08/2007

Werner Betzenbichler

Head of the certification Body "Climate and Energy" and Carbon Management Service

Annex 3

MONITORING PLAN

See Section D for the monitoring plan