CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

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Title: Reducing the Average Clinker Content in Cement at CEMEX Mexico Operations.
Version 02
Date: 28/06/2007

A.2. Description of the project activity:

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CEMEX S.A. de C.V. (CEMEX) is an international cement producer originated in Monterrey, Mexico. CEMEX S.A. de C.V. has fifteen cement plants in Mexico, and an installed capacity of 27.2 Million Tonnes per annum.

The project activity consists in the reduction of the average clinker content in the cement of resistance Class 30R (30 N/mm2 after 28d) produced CEMEX Mexico Operations. The average clinker percentage is expected to decrease from 78,4%, in the base year, to over 72,1% in the crediting period.

Clinker is the most important material for cement production. Clinker manufacturing includes:

1. Pre-processing (grinding and crushing)
2. Pyro-processing of the raw meal

The clinker manufacturing process is an energy intensive process. The project activity aims to optimally utilize the clinker in Portland Pozzolan Cement (PPC) and Compound Portland Cement (CPC) Class 30R (Class 30R is defined by the Mexican standard NMX C-414 ONNCCE 2004). The clinker percentage reduction by adding various additive materials such as pozzolan, limestone, fly ash, slag … would conserve natural resources such as fossil fuels and diminish the burning of fossil fuels from which temperature and electricity are obtained for cement manufacture. The project activity would therefore diminish GHG emissions from clinker production such as from a reduced consumption of electricity per unit of cement produced.

The project activity contributes to sustainable development at the local, regional and global levels in the following ways:

Environmental sustainability:

- GHG emissions reduction: Clinker production from raw material is the main source of CO_2 emissions during cement production. The project activity consists in the reduction of clinker percentage in cement production, resulting in GHG emission reductions.

- Thermal and electrical energy conservation: The project activity reduces specific thermal and electrical energy consumption for cement production.

- Industrial waste utilization: Fly ash is an industrial waste from power plants. Fly ash disposal is a major environmental problem of coal based thermal power plants. The project activity facilitates

fly ash utilization and disposal on the part of coal fired thermal power plants. Slag is an industrial waste from steel industry. This waste would be disposed in a sustainable manner in cement plants. The project indirectly encourages the development of waste management infrastructure.

- Other harmful emissions such as NO_x and SO_x are reduced by the project activity.

- Resource conservation. The project activity preserves resources in the following way:
  - Reduction in the quantity of limestone required for cement production.
  - Reduction of fossil fuels used for cement production.

  This resource conservation promotes sustainable development by the ways of
  - Reduction in quarry mining for limestone extraction.
  - Reduction of associated fugitive dust emissions.
  - Reduction of land destruction and erosions arising from such activities.
  - Reduction in adverse health impacts caused from quarrying of materials on nearby habitats and ecosystem.

Economic sustainability:

The project would create new employment opportunities as more labor is required for preparing and transporting the additive materials.

Social sustainability:

Throughout the local stakeholder consultation process, no negative responses were received; thereby the project would not create any conflicts with local community.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host Party)	**Private and/or public entity(ies) project participants (*) (as applicable)**	**Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)**
Govt. of Mexico	CEMEX Mexico, S.A. de C.V.	No

Table 1. Project participants

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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Mexico.

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

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Various (See detailed list in A.4.1.4.).

A.4.1.3. City/Town/Community etc:

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Various (See detailed list in A.4.1.4.).

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

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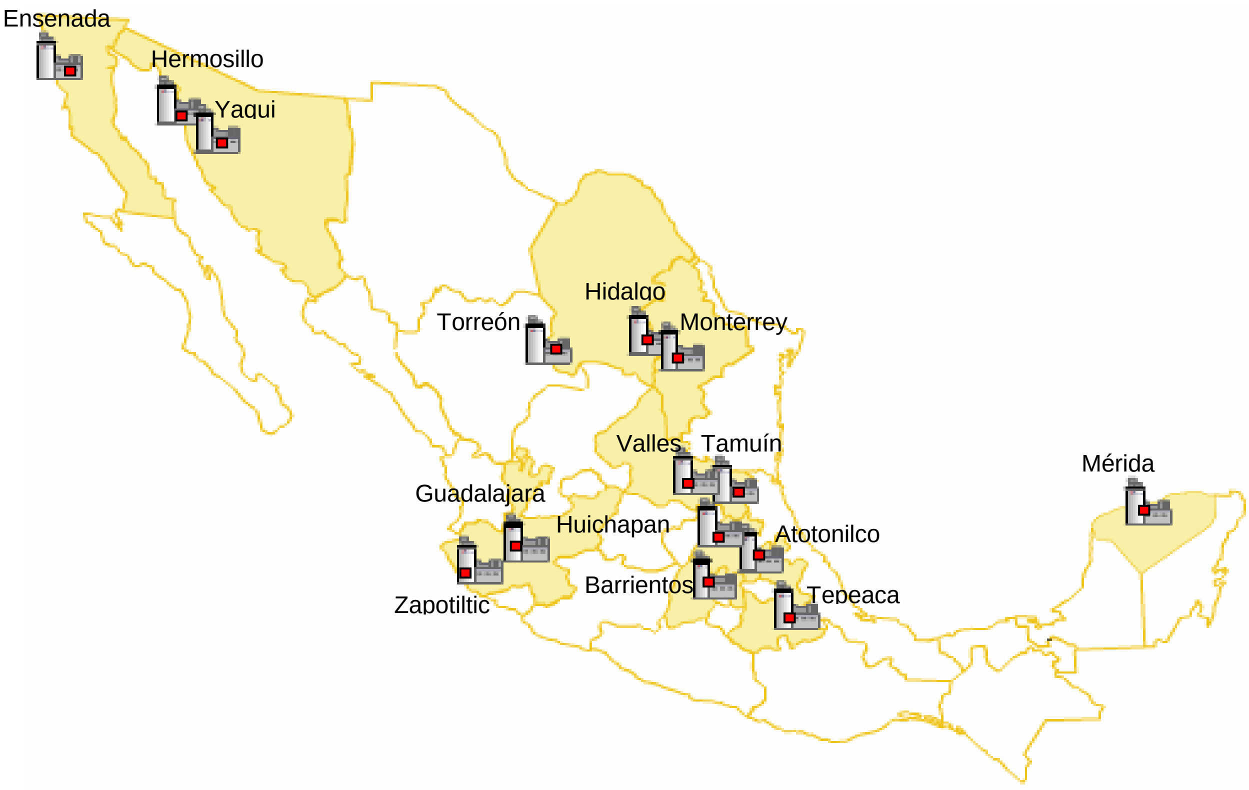
The location of the CEMEX Mexico's plants is detailed as follows:

Plant Name	State	Address	Coordinates
Planta Atotonilco	Hidalgo	Barrio Boxfi s/n Tolteca 42980 Atotonilco de Tula	20°21'43''N 99°12'28''W
Planta Barrientos	Mexico (State)	Vía Gustavo Baz No. 4500 San Pedro Barrientos 54110 Tlalnepantla	19°34'40''N 99°14'57''W
Planta Campana	Sonora	Carr. Hermosillo-Sahuarida km. 23.5 83000 Hermosillo	29°3'39''N 110°43'11''W
Planta Ensenada	Baja California	Arroyo El Gallo s/n Col. Carlos Pacheco 22890 Ensenada	31°50'56''N 116°35'0''W
Planta Guadalajara	Jalisco	Gobernador Curiel No. 5300 Las Juntas 44940 Guadalajara	20°36'8''N 103°20'22''W
Planta Hidalgo	Nuevo León	Galeana No. 300 Sur Centro 65600 Hidalgo	25°58'23''N -100°27'14''W
Planta Huichapan	Hidalgo	Rancho La Sala, Ejido el Maney 42400 Huichapan	20°23'7''N 99°41'4''W
Planta Mérida	Yucatán	Carr. Mérida-Umán km. 6 Ciudad Industrial 97178 Mérida,	20°56'33''N 89°39'50''W
Planta Monterrey	Nuevo León	Av. Independencia No. 901-A Ote. Col. Cementos 64520 Monterrey	100°17'50''N 25°41'50''W
Planta Tamuín	San Luis Potosí	Fracc. Estación Las Palmas s/n 79200 Tamuín	22°2'40''N 98°52'7''W
Planta Tepeaca	Puebla	Ex-Hacienda San Lorenzo s/n 75220 Cuautinchán	19°5'23''N 97°57'52''W
Planta Torreón	Coahuila	Carr. 30 km. 3.5 Fracc. Loreto 27000 Torreón	25°29'9''N -103°23'51''W
Planta Valles	San Luis Potosí	Carr. Valles-Tampico km. 5.5 79000 Ciudad Valles	21°59'3''N 98°57'54''W
Planta Yaqui	Sonora	Carr. A La Colorada km. 17.5 Sucursal Nuevo Hermosillo Apartado Postal 50-2 85540 Hermosillo	28°55'0''N 110°50'0''W
Planta Zapotiltic	Jalisco	Carr. Zapotiltic-Tamazula km. 4.5 49600 Zapotiltic, El Mirador	19°40'16''N 103°22'25''W

Table 2. Plants' information.



A.4.2. Category (ies) of project activity:

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The project is a cement sector project activity and may principally be categorized in the scope 4: Manufacturing Industries.

A.4.3. Technology to be employed by the project activity:

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The necessary measures to increase the amount of additions can be roughly divided into two groups:

- **Clinker and cement quality:** better process control, changes in clinker composition, use of active agents in the formation of clinker phases, regular microscope analysis of clinker, use of chemical additives in cement manufacture, finer grinding.
- **Logistics**:
  - Additional storage facilities,
  - Scales,
  - Dosage systems,
  - Mechanical separators of cement.

In order to maintain actual clinker quality, improved clinker quality is needed and the grinding process requires more stringent control. As a consequence, this project must be supported by further efforts including additional equipment and installations as well as research and development (R&D).

Additional equipment and installations:

The equipment that will be required for the project implementation is mainly for metering, milling, grinding, packages and crushing, as well as the additional equipment necessary for laboratory tests, such as microscopes and specialized devices to overcome the barriers detailed in Section B.5.

On other hand equipment for identify, meter and control the chemical additives, will be required.

Internal training:

Internal training is required to ensure a successful introduction of new cement type with less clinker percentage. This training effort addresses production, testing, quality control and marketing aspects.

A.4.4 Estimated amount of emission reductions over the chosen crediting period:

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A fixed crediting period formula starting in January 1, 2008, has been selected, with an overall CO_2 emission reduction expected of 2.331.078 tCO2 for CEMEX Mexico Operations.

Year	Annual estimation of emission reductions in tonnes of CO2 e
2008	200.370
2009	295.909
2010	385.461
2011	373.497
2012	334.053
2013	278.184
2014	217.973
2015	153.184
2016	83.571
2017	8.877
Total estimated reductions (tonnes of CO2 e)	2,331,078
Total number of crediting years	10 Years
Annual average of estimated reductions over the crediting period (tonnes of CO2 e)	233.108

Table 3. Emission reductions

A.4.5. Public funding of the project activity:

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No public funding is used for this project activity.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

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For the project activity, the approved baseline methodology used is ACM0005 Version 03, consolidated baseline methodology for *"increasing the Blend in cement production"*.

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

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This methodology is applicable to the projects to increase the share of additives (thus reducing the percentage of clinker) in cement production. The share of additives will be increased in CEMEX Mexico's plants.

CEMEX Mexico project activity fulfils all the applicability conditions of the consolidated baseline methodology for *"increasing the Blend in cement production*".

- There is no shortage of additives related to the lack of blending materials. Project participants should demonstrate that there is no alternative allocation or use for additional amount of additives used in the project activity. If the surplus availability of additives is not substantiated the project emissions reductions (ERs) will be discounted as outlined below.

The additives (limestone, pozzolan, fly ash and slag) are available in abundance in the different project activity regions.

- This methodology is applicable to domestically sold output of the project activity plant and excludes export of blended cement.

All exported project activity output will not generate emission reductions. CEMEX Mexico expects to sell 12.3 Million of tonnes of CPC and PPC (Class 30R) per annum in the domestic market.

- Adequate data is available on cement types in the market.

Adequate data on cement type in the market is available. Adequate market data are provided by CANACEM (Cement National Chamber).

Therefore the project activity fulfils the applicability conditions specified in the methodology.

This baseline methodology shall be used in conjunction with the approved monitoring methodology ACM0005 ("Consolidated Monitoring Methodology for Increasing the Blend Cement Production").

B.3. Description of the sources and gases included in the project boundary

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Only CO2 is included in the project boundary. In line with methodology, changes in CH4, and N2O emissions are negligible.

	Source	Gas	Included?	Justification / Explanation
Baseline Emission	Limestone calcinations for clinker production.	CO_2	Yes	
		CH_4	No	Negligible.
		N_2O	No	Negligible.
	Fossil fuel consumption for clinker production	CO_2	Yes	
		CH_4	No	Negligible.
		N_2O	No	Negligible.
	Emissions from grid electricity for clinker production	CO_2	Yes	
		CH_4	No	Negligible.
		N_2O	No	Negligible.
Project Activity Emissions	Limestone calcinations for clinker production.	CO_2	Yes	
		CH_4	No	Negligible.
		N_2O	No	Negligible.
	Fossil fuel consumption for clinker production	CO_2	Yes	
		CH_4	No	Negligible.
		N_2O	No	Negligible.
	Emissions from grid electricity for clinker production	CO_2	Yes	
		CH_4	No	Negligible.
		N_2O	No	Negligible.
Leakage	Emissions due to fossil fuels use for the transport of additives.	CO_2	Yes	
		CH_4	No	Negligible.
		N_2O	No	Negligible.

Table 4. Sources and gases included in the project boundary.

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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Description is provided below on the application of methodology with respect to the identification of the baseline scenario and the determination of the benchmark.

As mentioned above the project is restricted to cements of resistance Class 30R. These cements are sold in 50-kilo package presentation and make up the majority of sales in Mexico.

CEMEX Mexico decided to exclude the other major resistance type sold in Mexico, Class 40, mainly for the following reason: After careful analysis CEMEX has come to the conclusion that the realistic clinker reduction potential in Class 40 in the coming years is very small; with the dynamic benchmark required by the methodology the overall CER generation would be very small.

Identification of baseline scenario.

As required by the methodology, project participants have to identify the most plausible scenario among all the realistic and credible alternatives for the relevant cement type that were available to them in the absence of the project activity and that are consistent with current rules and regulations.

The following plausible alternatives to the project activity were identified:

1. Project activity implementation not undertaken as CDM project activity;
2. Current practice continuation.

Alternative 1

This alternative corresponds to the proposed project activity; this is the reduction of the clinker content in CEMEX México operations from weighed average clinker content on 2006 of 78.41% to 72.27% at the end of the crediting period. This scenario will reduce the CO2 emissions from fossil fuel savings, calcinations emissions and electricity consumption required to produce the blended cement CPP and CPC 30R. In the absence of CDM, the project activity implementation would face various barriers. Therefore, this alternative is not a likely baseline scenario. This is discussed in detail in Section B.5 (Additionality assessment). This alternative is in compliance with all applicable legal and regulatory frameworks (NMX C-414 ONNCCE)

Alternative 2

This alternative is in compliance with all applicable legal and regulatory frameworks and is considered the most likely baseline scenario because it does not face any technical or market barriers and does not requires any additional investment. The trend over the last three years has been to increase the clinker content in order to maintain the internal quality standard. The current practice continuation will keep the same clinker content or even increase it due to the cement quality required by the national market. This will cause the increase of electricity and fuels consumption originating more GHG emissions per ton of blended cement. Therefore this is the baseline scenario.

Year	CEMEX Mexico clinker content in blended cement Class 30R (%)
2004	76,43%
2005	76,89%
2006	78,41%

Table 5. CEMEX Mexico clinker content: 2004, 2005 and 2006.

Selection of region for benchmark analysis:

The “Region” for the benchmark calculation needs to be clearly determined and justified by project participants. The national market has been selected as the “Region” for benchmark analysis.

Benchmark for the baseline emission.

For the calculation of baseline emissions it is required to establish the benchmark with respect to clinker percentage in cement Class 30R. As required by the methodology, the clinker percentage is calculated as the lowest value among the following:

i) The average (weighted by production) mass percentage of clinker for the highest blend cement brands for the relevant cement type in the region; or
ii) The production weighted average mass percentage of clinker in the relevant cement type in the top 20% (in terms of share of additives) of the total production of blended cement in the region; or
iii) The mass percentage of clinker in the relevant cement type produced in the proposed project activity plant before the implementation of the CDM project activity.

To determine the clinker percentage for options i) and ii) random and statistically significant samples are selected and analyzed for the percentage of clinker by an independent laboratory (*Instituto Mexicano de Cemento y Concreto (IMCYC)*).

For Option i) the average (weighted by production) mass percentage of clinker for the 5 highest blend cement brands for the relevant cement type in Mexico is 80,55%. For the Option ii) the production weighted average mass percentage of clinker in the top 20% (in terms of share of additives) of the total production of blended cement Class 30R in Mexico is 78,41%. Cement production data from CANACEM is used to determine the benchmark of the Mexican market. For Option iii) the mass percentage of clinker is 76,43% (the highest percentage of additives used of the 3 most recent years: year 2004).

The lowest clinker percentage is the Option iii) which is 76,43% and is considered as the benchmark.

As outlined in the methodology, the option to select a benchmark trend is selected. This trend is specified ex – ante, in the share of additives in the blended cement type based on the minimum of an annual 2% increase in additives.

For details on the benchmark calculation please refer to Annex 3.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality): >>

Analysis of the additionality of the project

To demonstrate the additionality of the project, the Tool for demonstration and assessment of additionality approved has been used, following all steps defined. These steps will demonstrate that the project activity is not the baseline scenario.

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

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

All realistic scenarios have been developed in Section B.4. These alternatives are:

1. Scenario 1: Project activity implementation not undertaken as CDM project activity.
2. Scenario 2: Current practice continuation.

Sub-step 1b. Enforcement of applicable laws and regulations

Production of PPC and PCC Class 30R is subject to Mexican Standard specification: NMX C-414 ONNCCE 2004. The two plausible alternatives are in compliance with current laws and regulations.

Step 2. Investment analysis
Investment analysis is not undertaken.

Step 3. Barrier analysis

The project proponent is required to determine whether the project activity faces barriers that:

(a) Prevent the implementation of this type of project activity; and
(b) Do not prevent the implementation of at least one of the alternatives through the following sub-steps

All the barriers that prevail for the project activity are detailed in Sub-step 3a.

Sub-step 3a. Identify barriers that would prevent the implementation of type of the proposed project activity.

The project activity would increase the blend in PPC and PCC Class 30R beyond the benchmark prevailing in the country. However the project activity implementation would face various barriers. These barriers are:

Technological Barrier:
The CEMEX Mexico project consists of reducing the clinker content used for the blended cement production, maintaining the same quality (strength) level which is measured as the resistance to compression. The clinker content reduction will be done with the utilization of additives that can be from natural (limestone, pozzolan, etc.) or industrial (fly ash, slag, etc.) sources, and independent of their origin, all potential additives to be used have to be analyzed in order to determine their forming components and in which proportions they can be fed, so that when they are used in the formulation of the cement, the cement complies with the quality standards applicable.

The implementation of the clinker reduction project requires the following series of activities:
- Development of new know-how.
- The newly generated know-how has to be disseminated and implemented. The following aspects have to be distinguished:
  - The corresponding technical staff has to receive training and necessary additional equipment has to be installed;

  - This also implies continuous support from technical advisors in order to transfer the required
  - Stick to new and more challenging operational practices (e.g. stricter tolerances for process control) after the initiation phase.
- Finally, the successful implementation of the measures requires additional quality control procedures.

Due to the lack of experience for the cement plants in this kind of projects failure in one or all of these activities will undoubtedly jeopardize the outcome of the whole project.

The following paragraphs detail the technical aspects of the technological barriers.

For the project implementation and to achieve the proposed clinker content reduction in the blended cement production, CEMEX Mexico has to develop methods and procedures to produce a clinker with the capacity to develop greater resistance levels, including:

- Increase in clinker reactivity through the optimal formation of the clinker phases alite and belite, where the adequate size and morphology of these phases can be obtained trough the kiln's optimal operation conditions. The potential of these measures is considerable, but in practical terms very hard to achieve: As the kiln is a large, complex system with a lot of thermal inertia the challenge is not only in determining the optimal temperatures, residence times etc. but also how to maintain these conditions in day-to-day operation. Operating conditions cannot be adjusted to pre-set values by just pressing buttons, this new operation requires careful changes in several control variables available such as flow rates, rotational speed of the kiln etc. An integral part of these efforts is the control of clinker quality with advanced techniques such as microscopy and X-ray diffraction which require both specialized equipment and careful training of the corresponding personnel.

- Clinker's reactivity increase through the use of mineralizing agents.
  - Primary mineralization: CEMEX Mexico has developed a methodology to improve clinker reactivity by utilizing materials and additives that facilitate the formation of the clinker's reactive phases (alite) at lower temperatures. However, implementing this innovative process in a given kiln requires significant additional effort: In order to carry out this process it is necessary to first evaluate in the laboratory the feasibility of mineralizing the raw meal, once the feasibility is checked, industrial tests are carried out using the methodology developed by CEMEX Mexico, with these tests results and once is checked that the clinker's reactivity increases and that the processes can be controlled without a deterioration in their performance and normal operation, the routine use of these mineralizing materials is authorized.
  - Secondary mineralization consists in the utilization of a mix of mineralizing agents in the optimal dosage which improve the formation of the clinker's reactive phases; normally these materials contain sulfur and fluorated compounds. CEMEX Mexico has developed the basics of the technology necessary for the utilization of the secondary mineralization process, but the effectiveness and feasibility still has to be proven in laboratory and industrial-scale tests at all plants. Only if these tests are successfully concluded and the necessary procedures to control operating conditions are established will it be able to implement these practices in daily operation under strict operational and quality controls.

In both mineralization-enhancing processes (primary and secondary) training is required for the operation and quality personnel of the plants.

- Chemical changes in the raw materials fed to the kiln. The new operational methods need to add new materials into the kiln system, the aim is to main clinker components as stable as possible and learn again how to operate the kiln system with these new materials in order to become favored in clinker reactivity.

- Stabilization of clinker and grinding quality. A higher potential variation in quality will force operators to increase the share of clinker in cement in order to make sure that the final product complies with both Mexican norms and internal standards. Additional training for operators will be required.

Other actions for reducing the clinker content in CEMEX Mexico cements are directed to the improvement of the cement's capacity for developing resistances, within these are:

- Utilization of chemical additives that improve the cement resistance. CEMEX Mexico will work in collaboration with chemical additives producers on the development of chemical compounds which, added to the cement, enhance the resistance development and thus the possibility of clinker substitution. The use of these chemical compounds involves the development of test methods and multiple laboratory tests to prove the effectiveness that these compounds have for improving cement resistance. Experience so far indicates that thorough dosing of these additives is crucial: with insufficient additive concentrations the quality-enhancing effect drops significantly, while concentrations above the optimal value do not contribute to resistance but only increase the consumption of these costly materials.

- Optimize fineness of the final product. Milling has an impact on cement quality in several ways. A finer cement will normally give higher tensile strength (due to greater surface area); further improvements can be achieved by an optimal particle size distribution is also an important factor. Implementing these concepts requires extensive industrial trials, more electricity consumption (and thus higher cost) for grinding, and often additional equipment such as last-generation size separators.

- Utilization of more reactive additives. In this process the clinker substitution will be trough the use of more reactive additives that normally are not used because they are located at greater distances from the plant than other materials, which represents a higher cost. For the utilization of these materials, their reactivity level (capacity to react with the clinker's hydration compounds) must be evaluated previous to their application in the cement production process and also carry out tests for determinate the utilization percentage.

- Reduce the variability in the cement grinding through a strict monitoring of the control variables and also by the utilization of last generation process and measurement equipments.

As it is mentioned, the previous methods for clinker content reduction in cement production are supported by an intense work in investigation and development of methods and processes for clinker and cement production, measurement equipment, materials controlling and processing, and personnel training for the application of these non traditional methodologies for the production and processes control.

The implementation of the project requires an arduous work in the laboratory, since several tests must be carried out to achieve cement quality and state verification, and the same goes for additives. Among the tests carried out are those referring to quality improving additive characterization and new material characterization for their use as additives. Tests must also be performed on Class 30R design cement for dedicated or special applications for huge massive works.

It also has to be emphasized that the clinkerization process, although it looks simple from the outside, involves a rather complex chemistry. Even small changes to the chemical composition of the raw meal and additives can significantly change the behavior of the system. This risk is not just an initial hurdle; even after the implementation of the project activity the risk of forced outages, caused for instance by blockage of the preheater or formation of the so-called rings, deposition of solidified material on the inside of the kiln. These outages are very costly because of the downtime, production losses and cost of repair. The reason for the increased risk of outages in the case of the project activity is on the one hand that the tolerances are narrower; on the other hand that with the use of e.g. additives the larger number of devices in the system (e.g. dosage systems) automatically increases the probability of the failure of at least one device.

Chemical additives, dosage is very important. If the amount to be added is below the optimum level the required level of strength will not be obtained and the clinker content in the cement will have to be increased. When adding more than the optimum no additional strength or clinker reduction will be gained, incurring only in additional production cost.

In summary the project activity requires development, training and implementation of measures in order to control the following variables that affect cement resistance:

- Mineralizing materials and their utilization in the clinker production processes
- Control parameters in kiln operation
- Raw meal composition and control of the mineralizing materials utilization.
- Clinker phases analysis by microscopy and x-ray diffraction.
- Chemical additives for the cement resistances improvement
- Chemical additives utilization in the cement production process.
- Evaluation methods of reactive additives.

For a description of the necessary equipment please refer to the section on investment barriers.

Market Barriers

Given the common perception that a diminution in the clinker percentage brings as consequence a diminution in the strength of the cement, the following actions are predicted to be carried out by the company for the purpose of attending the possible consequences of this perception:

1. A document will be drawn up based on the analysis of the strength of the cement samples of all the plants "before" and "after" each modification of the cement formulation based on clinker and addition content with the purpose of demonstrating that there would be no deterioration of the quality of the cement.
2. A dissemination and training process of sales personnel will be made for the purpose of creating awareness that formula changes will not have any impact on the quality of the cement.
3. A team of technical consultants will be available for addressing doubts and any restlessness that could arise, derived from the changes in the cement formulation.

A study about resistances of blended cement Class 30 was carried out by an independent laboratory, IMCYC, in the Mexican cement industry. The results of the study show that CEMEX Mexico produce blended cement with high resistance and low clinker content respect the rest of the Mexican cement industry. The objective of the project activity is to reduce the actual clinker percentage, thus final users may perceive a diminution in the resistance of blended cement. This study has been provided to the DOE.

Investment Barriers

For carrying out the project, the following equipment and facilities will be required:

- Mineralization facilities.
    - Equipment for material reception and unloading.
    - Transport equipment
    - Storage
    - Dosage
- Additives dosage facilities.
    - Equipment for material reception and unloading.
    - Transport equipment
    - Storage
    - Dosage
- Chemical additives dosage facilities
    - Transport equipment
    - Storage
    - Dosage
- Mechanical separators replacement for high efficiency separators in cement grinding to obtain a better granulometric distribution and thus to obtain a greater control of the strength.
- Laboratory equipment:
    - Infrared and ultraviolet spectrophotometers for chemical additives analysis and verification.
    - Detector and channel for the X-Ray fluorescence equipment required for the analysis and verification of the selected mineralizing materials.
    - X-Ray diffraction equipment.
    - Equipment for particle size distribution analysis

It is estimated an investment between 0.8 and 2.2 M USD per plant for the installation of the equipment previously mentioned, if necessary, depending on the characteristics and materials to be used as additives in each case.

Furthermore, due to the project implementation, operative costs could be increased due to the following:

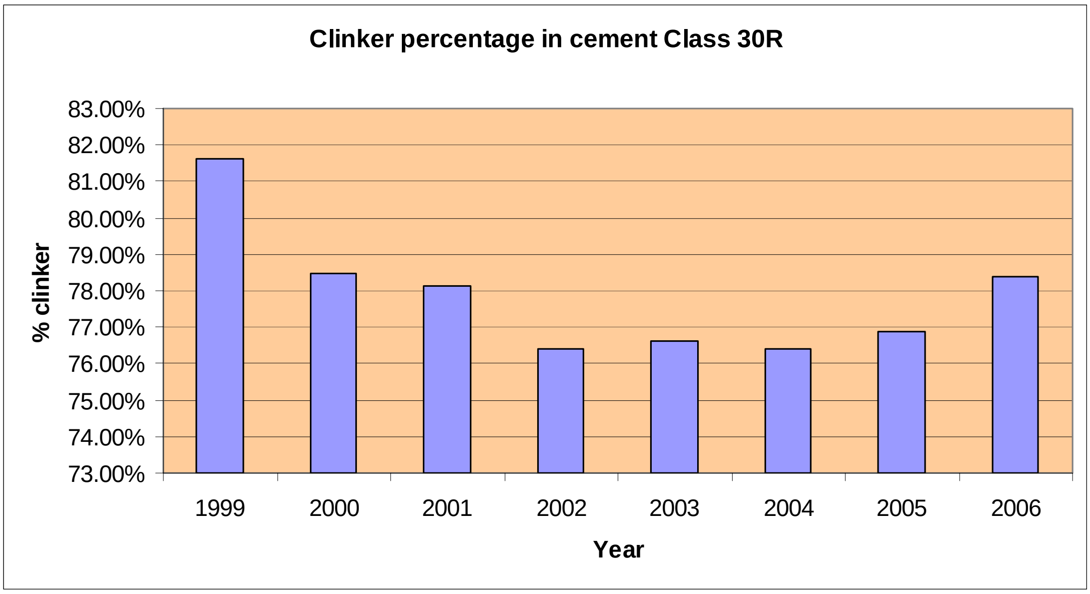
- Mineralization cost: greater costs for new materials as opposed to the conventional materials.
- High cost of the chemical additives for the clinker's quality improvement.
- Possibility of producing cement with greater finesse, this will implicate greater costs for cement grinding.

The incentive that represents the registration of the project as CDM has been considered in CEMEX Mexico and it is considered fundamental to be able to surpass the barriers described for project implementation.

Prevailing practice Barrier:

The benchmark analysis already shows that CEMEX is among the best in it class in Mexico for comparable cement quality. The expected final clinker content of around 72.3% is unprecedented. The argument is even much more valuable as it does not relate to a single cement plant but to the average of a group of 15 installations that work under different conditions; in particular, availability of active additives such as slag or fly ash differs significantly by plant.

Another argument is the history of clinker content in CEMEX Mexico (see graph). After the introduction of the new norm (NMX C-414 ONNCCE, October 1999) in 1999 (which gives cement producers more options to reduce the clinker content CEMEX began to reduce its average clinker content over several years. In 2002 this "business-as-usual reduction" came to a halt; the average clinker content stabilized and even showed a slight upward trend, indicating that CEMEX Mexico has come to a new stable situation where a new external trigger is necessary in order to achieve another reduction. This external trigger is the CDM: In June 2006 CEMEX's corporate energy department (which coordinates all of CEMEX's CDM projects) offered a workshop on the Clean Development Mechanism in Monterrey, Mexico, that was also attended by representatives of the quality control department (which now has the lead of the clinker reduction project). Motivated by the successful registration of the first projects under ACM0005, the decision was taken to explore the potential of a clinker reduction project in Mexico.



Graph 1. CEMEX Mexico clinker content (1999-2006)

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the project activity).

The alternative to the project activity is to keep the clinker ratio at the high levels observed in the base year. This alternative does not face any of the barriers identified above when compared to the project activity.

Step 4. Common practice analysis

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

The common practice in Mexico is to use a high percentage of clinker in cement Class 30R. See also documentation on benchmark.

Sub-step 4b. Discuss any similar options that are occurring.

There are no similar project activities to the proposed CDM project activity in Mexico.

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

A. Description of formulae used to estimate project emissions.

$PE_{BC,y}$ are estimated as below. In the project activity plant emissions are determined per unit of clinker or per unit of BC accounting for

- Emissions from limestone calcination;
- Emissions from fossil fuel combustion and electricity for clinker production and raw material processing;
- Emissions from electricity used for additives preparation and cement grinding.

In determining the emissions reduction there are 3 possibilities:

i. Emissions per tonne of clinker during the crediting period are less than baseline emissions per tonne of clinker ($PE_{Clinker,y} < BE_{Clinker}$); or
ii. Baseline and year Y emissions per tonne of clinker are equal ($PE_{Clinker,y} = BE_{Clinker}$); or
iii. Emissions per tonne of clinker in year Y are greater than the baseline emissions per tonne of clinker ($PE_{Clinker,y} > BE_{Clinker}$).

As this methodology is restricted to increase in percentage of blend only and not to efficiency improvements or fuel switching, in case (i), the baseline value is substituted by the project activity value. That is, if emissions per tonne of clinker are lower during the crediting period, then the lower value is taken for the baseline. The choice of the lower value aims at avoiding potential perverse incentives for project participants to increase the emissions intensity of clinker production as a result of the project activity (e.g. by switching from less carbon-intensive energy sources to more carbon intensive energy sources).

In case (iii) the emissions per tonne of clinker are higher during the crediting period than the baseline. This could be due to declining efficiency or a fuel switch or some other reason. In this case, there is a possibility that project activity emissions exceed the baseline emissions for some years in the crediting period. In this case, the project does not get new credits for emissions reduction till the net balance for the project is positive. In the case that overall negative emission reductions arise in a year, ERs are not issued to project participants for the year concerned and in subsequent years, until emission reductions from subsequent years have compensated the quantity of negative emission reductions from the year concerned.

CO_2 per tonne of blended cement in the project activity in year Y is calculated as below:

$$\mathbf{PE_{BC,y} = [PE_{clinker,y} * P_{Blend,y}] + PE_{ele\_ADD\_BC,y}}$$

Where:

$PE_{BC,y}$= CO2 emissions per tonne of BC in the project activity plant in year Y (tCO2/tonne BC)
$PE_{clinker,y}$ = CO2 emissions per tonne of clinker in the project activity plant in year Y (tCO2/tonne clinker) and defined below
$P_{Blend,y}$ = Share of clinker per tonne of BC in year Y (tonne of clinker/tonne of BC)
$PE_{ele\_ADD\_BC,y}$ = Electricity emissions for BC grinding and preparation of additives in year Y (tCO2/tonne of BC)

CO2 per tonne of clinker in the project activity in year Y is calculated as below:

$$\mathbf{PE_{clinker,y} = PE_{calcin,y} + PE_{fossil\_fuel,y} + PE_{ele\_grid\_CLNK,y}}$$

Where:

$PE_{clinker,y}$= Emissions of CO2 per tonne of clinker in the project activity plant in year Y (tCO2/tonne clinker)
$PE_{calcin,y}$ = Emissions per tome of clinker due to calcinations of calcium carbonate and magnesium carbonate in year Y (tCO2/tonne clinker)
$PE_{fossil\_fuel, y}$ = Emissions per tonne of clinker due to combustion of fossil fuels for clinker production in year Y (tCO2/tonne clinker)
$PE_{ele\_grid\_CLNK,y}$ = Grid electricity emissions for clinker production pa tonne of clinker in year Y (tCO2/tonne clinker)[1]

$$\mathbf{PE_{calcin,y} = [0.785*(OutCaO_y - InCaO_y)+ 1.092*(OutMgO_y- InMgO_y)]/ [CLNK_y* 1000]}$$

Where:

$PE_{calcin,y}$ = Emissions from the calcinations of limestone (tCO2/tonne clinker)
0.785 = Stoichiometric emission factor for CaO (tCO2/t CaO)
1.092 = Stoichiometric emission factor for MgO (tCO2/t MgO)
$InCaO_y$ = CaO content (%) of the raw material * raw material quantity (tonnes)
$OutCaO_y$ = CaO content (%) of the clinker * clinker produced (tonnes)
$InMgO_y$ = MgO content (%) of the raw material * raw material quantity (tonnes)
$OutMgO_y$ = MgO content (%) of the clinker * clinker produced (tonnes)

$$\mathbf{PE_{fossil\_fuel, y} = [\Sigma FF_{i\_,y} * EFF_i] /CLNK_y * 1000}$$

Where:
$FF_{i\_,y}$ = Fossil fuel of type i consumed for clinker production in year Y (tonnes of fuel i)
EFF_i = Emission factor for fossil fuel i (tCO2 / tonne of fuel)
$CLNK_y$ = Annual production of clinker in year Y (kilo tonnes of clinker)

[1] Electricity consumption for clinker production will be supplied from the national grid.

$$\mathbf{PE_{ele\_grid\_CLNK,\,y} = [PELE_{grid\_CLNK,y} * EF_{grid\_y}] \,/\, [CLNK_y * 1000]}$$

Where:
$PELE_{grid\_CLNK,\,y}$ = Grid electricity for clinker production in year Y (MWh)
EF_{grid_y} = Grid emission factor in year Y (tCO2/MWh)
$CLNK_y$ = Annual production of clinker in year Y (kilotonnes of clinker)

$$\mathbf{PE_{ele\_ADD\_BC,\,y} = PE_{ele\_grid\_BC,y} + PE_{ele\_grid\_ADD,y}}$$

Where:
$PE_{ele\_grid\_BC}$ = Grid electricity emissions for BC grinding in year Y (tCO2/tonne of BC)
$PE_{ele\_grid\_ADD}$ = Grid electricity emissions for additive preparation in year Y (tCO2/tonne of BC)[2]

$$\mathbf{PE_{ele\_grid\_BC,y} = [PELE_{grid\_BC,y} * EF_{grid\_BSL,y}]/[BC_y * 1000]}$$

Where:
$PELE_{grid\_BC,y}$ = Baseline grid electricity for grinding BC (MWh)
EF_{grid_y} = Grid emission factor in year Y (t CO2/MWh)
BC_y = Annual production of BC in year Y (kilotonnes of BC)

$$\mathbf{PE_{ele\_grid\_ADD} = [PELE_{grid\_ADD} * EF_{grid\_y}] \,/[BC_y * 1000]}$$

Where:
$PELE_{grid\_ADD}$ = Grid electricity for grinding additives (MWh)
EF_{grid_y} = Grid emission factor in year Y (t CO2/MWh)
BC_y = Annual production of BC in year Y (Kilotonnes of BC)

B. Description of formulae used to estimate baseline emissions.

The formulae used for calculation of the baseline emissions are as follows:

$$\mathbf{BE_{BC,y} = [BE_{clinker} * B_{Blend,y}] + BE_{ele\_ADD\_BC}}$$

Where:
$BE_{BC,y}$ = Baseline CO_2 emissions per tonne of blended cement type (BC) (tCO2/tonne BC)
$BE_{clinker}$ = CO_2 emissions per tonne of clinker in the baseline in the project activity plant (tCO2/tonne clinker) and defined below
$B_{Blend,y}$= Baseline benchmark of share of clinker per tonne of BC updated for year Y (tonne of clinker/tonne of BC)
$BE_{ele\_ADD\_BC}$ = Baseline electricity emissions for BC grinding and preparation of additives (tCO_2/tonne of BC)

CO_2 per tonne of clinker in the baseline is calculated as below:

$$\mathbf{BE_{clinker} = BE_{calcin} + BE_{fossil\_fuel} + BE_{ele\_grid\_CLNK}}$$

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[2] Electricity consumption for BC grinding and additive preparation will be supplied from the national gris.

Where:
$BE_{clinker}$ = Baseline emissions of CO2 per tonne of clinker in the project activity plant (tCO2 / tonne clinker)
BE_{calcin} = Baseline emissions per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate (tCO2 / tonne clinker)
BE_{fossil_fuel} = Baseline emissions per tonne of clinker due to combustion of fossil fuels for clinker production (tCO2/tonne clinker)
$BE_{ele\_grid\_CLNK}$ = Baseline grid electricity emissions for clinker production per tonne of clinker (tCO2/tonne clinker)

$$\mathbf{BE_{calcin} = [0.785*(OutCaO - lnCaO) + 1.092*(OutMgO - InMgO) / [CLNK_{BSL} * 1000]}$$

Where:
BE_{calcin} = Emissions from the calcinations of limestone (tCO2/tonne clinker)
0.785 = Stoichiometric emission factor for CaO (tCO2/ t CaO)
1.092 = Stoichionietric emission factor for MgO (tCO2/t MgO)
InCaO = CaO content (%) of the raw material * raw material quantity (tomes)
OutCaO = CaO content (%) of the clinker * clinker produced (tonnes)
InMgO = MgO content (%) of the raw material * raw material quantity (tonnes)
OutMgO = MgO content (%) of the clinker * clinker produced (tonnes)
$CLNK_{BSL}$ = Annual production of clinker in the base year (kilotonnes of clinker)

$$\mathbf{BE_{fossil\_fuel} = [\Sigma\ FF_{i\_BSL}*EFF_i] / CLNK_{BSL} *1000}$$

Where:
FF_{i_BSL} = Fossil fuel of type i consumed for clinker production in the baseline (tonnes of fuel i)
EFF_i = Emission factor for fossil fuel i (t CO2 / tonne of fuel)
$CLNK_{BSL}$ = Annual production of clinker in the base year (kilotonnes of clinker)

$$\mathbf{BE_{ele\_grid\_CLNK} = [BELE_{grid\_CLNK} * EF_{grid\_BSL}] / CLNK_{BSL} * 1000}$$

Where:
$BE_{elegrid\_CLNK}$ = Baseline grid electricity for clinker production (MWh)
EF_{grid_BSL} = Baseline grid emission factor (t CO2/MWh)
$CLNK_{BSL}$ = Annual production of clinker in the base year (kilotonnes of clinker)

$$\mathbf{BE_{ele\_ADD\_BC} = BE_{ele\_grid\_BC} + BE_{ele\_grid\_ADD}}$$

Where:
$BE_{ele\_grid\_BC}$ = Baseline grid electricity emissions for BC grinding (tCO2/tonne of BC)
$BE_{ele\_grid\_ADD}$ = Baseline grid electricity emissions for additive preparation (tCO2/tonne of BC)

$$\mathbf{BE_{ele\_grid\_BC} = [\ BELE_{grid\_BC} * EF_{grid\_BSL}] /[BC_{BSL}* 1000]}$$

$BELE_{grid\_BC}$ = Baseline grid electricity for grinding BC (MWh)
EF_{grid_BSL} = Baseline grid emission factor (t CO2/MWh)

BC_{BSL} = Annual production of BC in the base year (kilotonnes of BC)
BC_{BSL} = Annual production of BC in the base year (kilotonnes of BC)

$BE_{ele\_grid\_ADD}$ = [$BELE_{grid\_ADD}$ * EF_{grid_BSL}] /[BC_{BSL}* 1000]

$BELE_{grid\_ADD}$ = Baseline grid electricity for grinding additives (MWh)
EF_{grid_BSL} = Baseline grid emission factor (t CO2/MWh)

Calculation of electricity baseline emission factor.

For the calculation of the specific emissions from power generation from the grid, the approved consolidated baseline methodology ACM0002 is applied.

The electricity baseline emission factor is calculated as a Combined Margin (CM), consisting of the combination of Operating Margin (OM) and Build Margin (BM) factors according to the following steps. Calculation for this combined margin are based on data from an official source (where available) and made publicly available.

Step 1: Calculation the Operating Margin emission factor

Simple Operating Margin has been chosen for calculations since the low – cost / must run resources constitute less than 50% of the total grid generation in the National Grid.

For calculating the Simple OM, the generation-weights average emission per electricity unit (tCO_2/MWh) of all generating sources serving the system excluding the low-cost/must run generation units is used:

$$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y}.COEF_{i,j}}{\sum_{j} GEN_{j,y}}$$

Where:

$F_{i,j,y}$ is the consumption of fuel *i* (in TJ) by fuel sources *j* in year *y*
j, refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid,
$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel i in tCO_2/TJ
$GEN_{j,y}$ is the electricity in MWh delivered to the grid by the j source

This $COEF_{i,j}$ (in tC/TJ) can be found in the Revised 1996 IPCC Guidelines for Greenhouse Gas Inventories: Workbook,. Data for F_{ij} can be found in TJ/day in the three *Prospectivas* so total annual consumption per fuel source can be calculated by multiplying by 365.

Step 2. Calculate the Build Margin emission factor ($EF_{BM,}$) as the generation-weighted average emission factor (tCO_2/GWh) of a sample of power plants *m*, as follows:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y}.COEF_{i,m}}{\sum_{m} GEN_{m,y}}$$

Where $F_{i,m,y}$, $COEF_{i,m}$ and $GEN_{m,y}$ are analogous to the variables described for the simple OM method above for plants m.

This sample for power plants can be chosen from the two options proposed under the methodology. We have chosen Option 1. Calculate the Build Margin emission factor $EF_{BM,y}$ ex-ante based on the most recent information available on plants already built for sample group *m* at the time of PDD submission. For this option, the sample has to be either:

Option A: The five power plants that have been built most recently.
Option B: Or the power plants capacity additions in the electricity system that comprises 20% of the system generation (in GWh) and that have been built most recently.

Option B has been selected to calculate the BM because generation of five power plants built most recently is lower than 20% of the system generation (in GWh).

The following plants have been used to calculate the BM:

Plant name	Technology	Capacity (MW)
Additions 2005		
Hol Box	IC	0,8
La Laguna II	CC	498
Rio Bravo IV	CC	500
Botello	Hydro	9
Baja California Sur I	IC	42,9
Yécora	IC	0,7
Ixtaczoquitlán	Hydro	1,6
Hermosillo	CC	93,3
Additions 2004		
Chicoasén (Manuel Moreno Torres)	Hydro	900
Rio Bravo III (PIE)	CC	495
El Sauz*	CC	128
Tuxpan (Pdte. Adolfo López Mateos)	GT	163
San Lorenzo Potencia	GT	266
Guerrero Negro II	IC	10,8
Additions 2003		
Los Azufres	Geo	106,6
Calera (bloque) (Arrendamiento)	IC	0
El Verde (Arrendamiento)	GT	0

Las Cruces (Arrendamiento)	GT	0
Dos Bocas (bloque) (Arrendamiento)	GT	0
Tuxpan III y IV (PIE)	CC	983
Altamira III y IV (PIE)	CC	1036
Mexicali (PIE)	CC	489
Transalta Campeche (PIE)	CC	252,4
Naco Nogales (PIE)	CC	258
Transalta Chihuahua III (PIE)	CC	259
Additions 2002		
Hol Box	IC	0,8
Bajío	CC	565
Altamira II	CC	495
Río Bravo II	CC	495
Monterrey III	CC	449
Valle de México	GT/CC	249,3
El Sauz	GT/CC	129
El Encino	GT	130,8
Additions 2001		
Tres Vírgenes	GEO	10
Saltillo (PIE)	CC	248
Chihuahua II (El Encino)	CC	554
Presidente Juárez	CC	1026
Hermosillo (PIE)	CC	250
Tuxpan II (PIE)	CC	495
El Verde		0
Puerto San Carlos	IC	104

Table 6. New power plants installed. Source: Sener. "*Prospectiva del sector eléctrico 2006-2015 Cuadro 13 p.57; Prospectiva del sector eléctrico 2005-2014 Cuadro 14 p.51; Prospectiva del sector eléctrico 2004-2013 Cuadro 9 p.44* and *Prospectiva del sector eléctrico 2003-2012 Cuadro 8 p.39*", CFE. "*Programa de Obras e Inversiones del Sector Eléctrico 2002-2011 p.2-4" and 2005 Generation data provided by CFE Planning Department.* Abbreviations: Hydro: hydropower plant; Geo: geothermal plant, CC: combined cycle plant, fuelled with natural gas, GT: Gas turbine, fuelled with natural gas. IC: Internal combustion.

The technical data of typical power plants are given in the source as follows:

	Capacity (MW)	Efficiency (%)
Gas turbine	1 x 42.6	37.55
	1 x 85	29.76
	1 x 190	33.81
	1 x 261	35.73
	1 x 41.4	**38.08**
Diesel	3 x 3.4	43.53
	3 x 13.5	47.35
	2 x 18.7	**47.61**
Combined Cycle	1 x 290	51.85
	1 x 581	52.03

	1 x 388	52.46
	1 x 776	**52.58**

Table 7. Technical data of typical fossil power plants of the types installed in the last years. Best-in-class values are highlighted. Source: Sener. "Prospectiva del sector eléctrico 2005-2014 Cuadro 40 p.94"

C. Description of formulae used to estimate leakage

Emissions due to fuel use for the transport of raw materials, fossil fuels and additives from off site locations to the project plants. The transport related emissions for raw materials and fuels are likely to decrease. To keep the methodology conservative, this change shall not be included. Because of the project activity, emissions due to transportation of additives will increase. These emissions will be accounted as leakage. Transport related emissions linked to additives per tonne of additive are calculated as below:

$$\mathbf{L_{add\_trans} = [(TF_{cons} * D_{add\_source} * TEF) * 1/Q_{add} * 1/1000 + (ELE_{conveyor\_ADD} * EF_{grid}) * 1/ADD_y]}$$

Where:
L_{add_trans} = Transport related emissions per tonne of additives (tCO2 / tonne of additive)
TF_{cons} = Fuel consumption for the vehicle per kilometre (kg of fuel / kilometre)
D_{add_source} = Distance between the source of additive and the project activity plant (km)
TEF = Emission factor for transport fuel (kg CO2/kg of fuel)
$ELE_{conveyor\_ADD}$ = Annual Electricity consumption for conveyor system for additives (MWh)
EF_{grid} = Grid electricity emission factor (tonnes of CO2/MWh)
Q_{add} = Quantity of additive carried in one trip per vehicle (tonnes of additive)
ADD_y = Annual consumption of additives in year y (t of additives)
And leakage emissions per tonne of BC due to additional additives are determined by

$$\mathbf{L_y = L_{add\_trans} * [A_{blend,y} - P_{blend,y}] * BC_y}$$

Where:
L_y = Leakage emissions for transport of additives (kilotonnes of CO2)
$A_{blend,y}$ = Baseline benchmark share of additives per tonne of BC updated for year Y (tonne of additives / tonne of BC)
$P_{blend,y}$ = Share of additives per tonne of BC in year Y (tonne of additives / tonne of BC)

Another possible leakage is due to the diversion of additives from existing uses. The PPs shall demonstrate that additional amounts of additives used are surplus. If the PPs do not substantiate x tones of additives are surplus, the project emissions reductions are reduced by the factor a, which is defined as:

$\boldsymbol{\alpha}_y$ = x tonnes of additives in year Y / total additional additives used in year Y

D. Description of formulae used to estimate emission reductions for the project activity

The project activity mainly reduces CO_2 emissions through substitution of clinker in cement by blending materials. Emissions reductions in year Y are the difference in the CO2 emissions per tonne of BC in the baseline and in the project activity multiplied by the production of BC in year Y. The emissions reductions are discounted for the percentage of additives for which surplus availability is not substantiated.

Emission reductions by the project activity

$$ER_y = \{[BE_{BC,y} - PE_{BC,y}] * BC_y + L_y\} * (1 - \alpha_y)$$

Where:
ER_y = Emission reductions in year Y due to project activity (thousand tonnes of CO2)
$BE_{BC,y}$ = Baseline emissions per tonne of BC (tCO2/tones of BC)
$PE_{BC,y}$ = Project emissions per tonne of BC in year Y (tCO2/tonnes of BC)
BCy = BC production in year Y (thousand tonnes)
L_y = Leakage emissions for transport of additives (kilotonnes of CO2)
α_y = x tones of additives in year Y / total additional additives used in year y

B.6.2. Data and parameters that are available at validation:

(Copy this table for each data and parameter)

Data and parameters for leakage.

Data / Parameter:	**TEF**
Data unit:	kg CO_2/kg of fuel
Description:	Emission factor for transport fuel
Source of data used:	IPCC default values
Value applied:	3.21 kg CO_2/kg of fuel
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated, once at the beginning of the crediting period, archived electronically.
Any comment:	The value applied is derived from multiplication of net calorific value of diesel and carbon emission factor of diesel. Both default values are available from IPCC.

Data and parameters for project and baseline scenario.

Data / Parameter:	**EFF_i**
Data unit:	tCO_2/TJ
Description:	Emission factor for fossil fuel
Source of data used:	IPCC default values
Value applied:	Coal: 96.07 tCO_2/TJ Pet coke: 100.83 tCO_2/TJ Fuel oil: 77.37 tCO_2/TJ Natural gas: 56.1 tCO_2/TJ Diesel: 74.07 tCO_2/TJ Used oils: 77.37 tCO_2/TJ Tyres: 85 tCO_2/TJ Liquids: 79.90 tCO_2/TJ Others: 0 tCO_2/TJ (conservative approach)

Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated, once at the beginning of the crediting period, archived electronically.
Any comment:	The value applied is derived from carbon content of fossil fuels. Both default values are available from IPCC.

Data / Parameter:	**EF_{grid_y} and EF_{grid_BSL}**
Data unit:	tCO_2/MWh
Description:	Grid Emission factor for baseline and project scenario.
Source of data used:	SENER (Secretaría de Energía) and CFE (Comisión Federal de Electricidad).
Value applied:	0.525 tCO_2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated, once at the beginning of the crediting period, archived electronically. This value is determined ex – ante under the methodology ACM0002.
Any comment:	This value is fixed for the project and baseline scenario.

B.6.3 Ex-ante calculation of emission reductions:

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Please see Annex 3.

B.6.4 Summary of the ex-ante estimation of emission reductions:

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Total emission reduction during the crediting period: 2.331.078 tCO_2 (See Annex 3)

Estimation of emission reductions:

Year	**Estimation of project activity emissions (tonnes of CO_2 e)**	**Estimation of baseline emissions (tonnes of CO_2 e)**	**Estimation of leakage (tonnes of CO_2 e)**	**Estimation of overall emission reductions (tonnes of CO_2 e)**
2008	9.198.377	9.401.370	-2.623	200.370
2009	9.477.958	9.777.741	-3.874	295.909
2010	9.787.972	10.178.479	-5.047	385.461
2011	10.165.930	10.544.318	-4.890	373.497
2012	10.542.275	10.880.701	-4.374	334.053
2013	10.912.914	11.194.740	-3.642	278.184
2014	11.296.526	11.517.353	-2.854	217.973
2015	11.693.564	11.848.754	-2.006	153.184
2016	12.104.499	12.189.165	-1.094	83.571
2017	12.529.816	12.538.809	-116	8.877
Total (tonnes of CO2 e)	107.709.833	110.071.430	-30.519	2.331.078

Table 8. Ex-ante estimation emission reductions.

The registration of the project will take place before its commissioning, so there will be no emission reductions prior to its registration.

B.7 Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data and parameters monitored for baseline and project emissions:

Note: Table template has slightly been adjusted to reduce total number of pages in PDD.

	Project Scenario	**Baseline Scenario**
Data / Parameter:	In CaOy content	In CaOBSL content
Data unit:	%	%
Description:	CaO content (%) of the raw material	CaO content (%) of the raw material
Source of data to be used:	Plants records (SICA)	Plant records (SICA)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	A complete spreadsheet will be provided to the Designated Operational Entity (DOE)	A complete spreadsheet will be provided to the Designated Operational Entity (DOE)
Description of measurement methods and procedures to be applied:	Chemical analysis by analytical / x-ray methods. Recording frequency: Daily.	Chemical analysis by analytical / x-ray methods. Recording frequency: Daily.
QA/QC procedures to be applied:	X-ray analysis procedures. All data is available and recorded according to ISO 9001 and ISO 14001 management systems.	X-ray analysis procedures. All data is available and recorded according to ISO 9001 and ISO 14001 management systems.
Any comment:	It will be estimated as part of normal operations.	It will be estimated as part of normal operations

	Project Scenario	**Baseline Scenario**
Data / Parameter:	Out CaOy content	Out CaOBSL content
Data unit:	%	%
Description:	CaO content (%) of the clinker	CaO content (%) of the clinker
Source of data to be used:	Plants records (SICA)	Plant records (SICA)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	A complete spreadsheet will be provided to the Designated Operational Entity (DOE)	A complete spreadsheet will be provided to the Designated Operational Entity (DOE)
Description of measurement methods	Chemical analysis by analytical / x-ray methods.	Chemical analysis by analytical / x-ray methods.

and procedures to be applied:	Recording frequency: Daily.	Recording frequency: Daily.
QA/QC procedures to be applied:	X-ray analysis procedures. All data is available and recorded according to ISO 9001 and ISO 14001 management systems.	X-ray analysis procedures. All data is available and recorded according to ISO 9001 and ISO 14001 management systems.
Any comment:	It will be estimated as part of normal operations	It will be estimated as part of normal operations

	Project Scenario	**Baseline Scenario**
Data / Parameter:	In MgOy content	In MgOBSL content
Data unit:	%	%
Description:	MgO content (%) of the raw material	MgO content (%) of the raw material
Source of data to be used:	Plants records (SICA)	Plant records (SICA)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	A complete spreadsheet will be provided to the Designated Operational Entity (DOE)	A complete spreadsheet will be provided to the Designated Operational Entity (DOE)
Description of measurement methods and procedures to be applied:	Chemical analysis by analytical / x-ray methods. Recording frequency: Daily.	Chemical analysis by analytical / x-ray methods. Recording frequency: Daily.
QA/QC procedures to be applied:	X-ray analysis procedures. All data is available and recorded according to ISO 9001 and ISO 14001 management systems.	X-ray analysis procedures. All data is available and recorded according to ISO 9001 and ISO 14001 management systems.
Any comment:	It will be estimated as part of normal operations	It will be estimated as part of normal operations

	Project Scenario	**Baseline Scenario**
Data / Parameter:	Out MgOy content	Out MgOBSL content
Data unit:	%	%
Description:	MgO content (%) of the clinker	MgO content (%) of the clinker
Source of data to be used:	Plants records (SICA)	Plant records (SICA)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	A complete spreadsheet will be provided to the Designated Operational Entity (DOE)	A complete spreadsheet will be provided to the Designated Operational Entity (DOE)
Description of measurement methods and procedures to be applied:	Chemical analysis by analytical / x-ray methods. Recording frequency: Daily.	Chemical analysis by analytical / x-ray methods. Recording frequency: Daily.
QA/QC procedures to	X-ray analysis procedures.	X-ray analysis procedures.

be applied:	All data is available and recorded according to ISO 9001 and ISO 14001 management systems.	All data is available and recorded according to ISO 9001 and ISO 14001 management systems.
Any comment:	It will be estimated as part of normal operations	It will be estimated as part of normal operations

	Project Scenario	**Baseline Scenario**
Data / Parameter:	CLNKy	CLNKBSL
Data unit:	Kilotonnes	Kilotonnes
Description:	Clinker produced	Clinker produced
Source of data to be used:	Plants records (GrafOper)	Plant records (GrafOper)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See Annex 3.	See Annex 3.
Description of measurement methods and procedures to be applied:	Continuous weighing and recording system. Recording frequency: Daily.	Continuous weighing and recording system. Recording frequency: Daily.
QA/QC procedures to be applied:	Data will be recorded from scales or flow meters and corrected with inventories. All data is available and recorded according to ISO 9001 and ISO 14001 management systems.	Data will be recorded from scales or flow meters and corrected with inventories. All data is available and recorded according to ISO 9001 and ISO 14001 management systems.
Any comment:	It will be calculated as part of normal operations.	It will be calculated as part of normal operations.

	Project Scenario	**Baseline Scenario**
Data / Parameter:	Quantity of raw material	Quantity of raw material
Data unit:	Kilotonnes	Kilotonnes
Description:	Raw materials consumed for the clinker production.	Raw materials consumed for the clinker production.
Source of data to be used:	Plants records (GrafOper)	Plant records (GrafOper)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	A complete spreadsheet will be provided to the Designated Operational Entity (DOE)	A complete spreadsheet will be provided to the Designated Operational Entity (DOE)
Description of measurement methods and procedures to be applied:	Continuous weighing and recording system. Recording frequency: Daily.	Continuous weighing and recording system. Recording frequency: Daily.
QA/QC procedures to	Data will be recorded from scales or	Data will be recorded from scales or

be applied:	flow meters. All data is available and recorded according to ISO 9001 and ISO 14001 management systems.	flow meters. All data is available and recorded according to ISO 9001 and ISO 14001 management systems.
Any comment:	It will be metered as part of normal operations.	It will be metered as part of normal operations.

	Project Scenario	**Baseline Scenario**
Data / Parameter:	BC_y	BC_{BSL}
Data unit:	Kilotonnes	Kilotonnes
Description:	Blended cement production.	Blended cement production.
Source of data to be used:	Plants records (GrafOper)	Plant records (GrafOper)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See Annex 3.	See Annex 3.
Description of measurement methods and procedures to be applied:	Continuous weighing and recording system. Recording frequency: Daily.	Continuous weighing and recording system. Recording frequency: Daily.
QA/QC procedures to be applied:	Data will be recorded from scales or flow meters. All data is available and recorded according to ISO 9001 and ISO 14001 management systems.	Data will be recorded from scales or flow meters. All data is available and recorded according to ISO 9001 and ISO 14001 management systems.
Any comment:	It will be metered as part of normal operations.	It will be metered as part of normal operations.

	Project Scenario	**Baseline Scenario**
Data / Parameter:	PELEgrid_CLNK	BELEgrid_CLNK
Data unit:	MWh	MWh
Description:	Grid electric power consumed during clinker production.	Grid electric power consumed during clinker production.
Source of data to be used:	Plants records (GrafOper)	Plant records (GrafOper)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	A complete spreadsheet will be provided to the Designated Operational Entity (DOE)	A complete spreadsheet will be provided to the Designated Operational Entity (DOE)
Description of measurement methods and procedures to be applied:	Measured on the metering equipment of CFE (Comisión Federal de Electricidad). Recording frequency: Monthly.	Measured on the metering equipment of CFE (Comisión Federal de Electricidad). Recording frequency: Monthly
QA/QC procedures to	Data will be recorded and verified from	Data will be recorded and verified from

be applied:	power (kW) meters. All data is available and recorded according to ISO 9001 and ISO 14001 management systems.	power (kW) meters. All data is available and recorded according to ISO 9001 and ISO 14001 management systems.
Any comment:	It will be measured as part of normal operations.	It will be measured as part of normal operations.

	Project Scenario	**Baseline Scenario**
Data / Parameter:	PELEgrid_BC,y	BELEgrid_BC
Data unit:	MWh	MWh
Description:	Grid electric power consumed for blended cement production.	Grid electric power consumed for blended cement production.
Source of data to be used:	Plants records (GrafOper)	Plant records (GrafOper)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	A complete spreadsheet will be provided to the Designated Operational Entity (DOE)	A complete spreadsheet will be provided to the Designated Operational Entity (DOE)
Description of measurement methods and procedures to be applied:	Measured on the metering equipment of CFE (Comisión Federal de Electricidad). Recording frequency: Monthly	Measured on the metering equipment of CFE (Comisión Federal de Electricidad). Recording frequency: Monthly
QA/QC procedures to be applied:	Data will be recorded and verified from power (kW) meters. All data is available and recorded according to ISO 9001 and ISO 14001 management systems.	Data will be recorded and verified from power (kW) meters. All data is available and recorded according to ISO 9001 and ISO 14001 management systems.
Any comment:	It will be metered as part of normal operations.	It will be metered as part of normal operations.

	Project Scenario	**Baseline Scenario**
Data / Parameter:	PELEgrid_ADD,y	BELEgrid_ADD
Data unit:	MWh	MWh
Description:	Grid electric power consumed for the blended cement production.	Grid electric power consumed for the blended cement production.
Source of data to be used:	Plants records (GrafOper)	Plant records (GrafOper)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	A complete spreadsheet will be provided to the Designated Operational Entity (DOE)	A complete spreadsheet will be provided to the Designated Operational Entity (DOE)
Description of measurement methods and procedures to be applied:	Measured on the metering equipment of CFE (Comisión Federal de Electricidad). Recording frequency: Monthly	Measured on the metering equipment of CFE (Comisión Federal de Electricidad). Recording frequency: Monthly

QA/QC procedures to be applied:	Data will be recorded and verified from power (kW) meters. All data is available and recorded according to ISO 9001 and ISO 14001 management systems.	Data will be recorded and verified from power (kW) meters. All data is available and recorded according to ISO 9001 and ISO 14001 management systems.
Any comment:	It will be metered as part of normal operations.	It will be metered as part of normal operations.

	Project Scenario	**Baseline Scenario**
Data / Parameter:	PEcalcin,y	BEcalcin,BSL
Data unit:	tCO_2/tonne of clinker	tCO_2/tonne of clinker
Description:	Emissions due to calcinations of calcium carbonate and magnesium carbonate.	Emissions due to calcinations of calcium carbonate and magnesium carbonate.
Source of data to be used:	Plants records	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See Annex 3.	See Annex 3.
Description of measurement methods and procedures to be applied:	Calculated under the formula provided by the Approved Methodology ACM0005. Recording frequency: Annually.	Calculated under the formula provided by the Approved Methodology ACM0005. Recording frequency: Annually.
QA/QC procedures to be applied:		
Any comment:		

	Project Scenario	**Baseline Scenario**
Data / Parameter:	PEfossil_fuel,y	BEfossil_fuel,BSL
Data unit:	tCO_2/tonne of clinker	tCO_2/tonne of clinker
Description:	Emissions due to combustion of fossil fuel for clinker production.	Emissions due to combustion of fossil fuel for clinker production.
Source of data to be used:	Plants records	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See Annex 3.	See Annex 3.
Description of measurement methods and procedures to be applied:	Calculated under the formula provided by the Approved Methodology ACM0005. Recording frequency: Annually.	Calculated under the formula provided by the Approved Methodology ACM0005. Recording frequency: Annually.
QA/QC procedures to be applied:		

Any comment:		

	Project Scenario	**Baseline Scenario**
Data / Parameter:	PEele_grid_CLNK,y	BEele_grid_CLNK,BSL
Data unit:	tCO_2/tonne of clinker	tCO_2/tonne of clinker
Description:	Grid electricity emissions for clinker production.	Grid electricity emissions for clinker production.
Source of data to be used:	Plants records	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See Annex 3.	See Annex 3.
Description of measurement methods and procedures to be applied:	Calculated under the formula provided by the Approved Methodology ACM0005. Recording frequency: Annually.	Calculated under the formula provided by the Approved Methodology ACM0005. Recording frequency: Annually.
QA/QC procedures to be applied:		
Any comment:		

	Project Scenario	**Baseline Scenario**
Data / Parameter:	PEele_grid_BC,y	BEele_grid_BC,BSL
Data unit:	tCO_2/tonne of blended cement	tCO_2/tonne of blended cement
Description:	Grid electricity emissions for grinding blended cement.	Grid electricity emissions for grinding blended cement.
Source of data to be used:	Plants records	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See Annex 3.	See Annex 3.
Description of measurement methods and procedures to be applied:	Calculated under the formula provided by the Approved Methodology ACM0005. Recording frequency: Annually.	Calculated under the formula provided by the Approved Methodology ACM0005. Recording frequency: Annually.
QA/QC procedures to be applied:		
Any comment:		

	Project Scenario	**Baseline Scenario**
Data / Parameter:	PEele_grid_ADD,y	BEele_grid_ADD,BSL
Data unit:	tCO_2/tonne of blended cement	tCO_2/tonne of blended cement
Description:	Grid electricity emissions for the preparation of additives in blended	Grid electricity emissions for the preparation of additives in blended

	cement.	cement.
Source of data to be used:	Plants records	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See Annex 3.	See Annex 3.
Description of measurement methods and procedures to be applied:	Calculated under the formula provided by the Approved Methodology ACM0005. Recording frequency: Annually.	Calculated under the formula provided by the Approved Methodology ACM0005. Recording frequency: Annually.
QA/QC procedures to be applied:		
Any comment:		

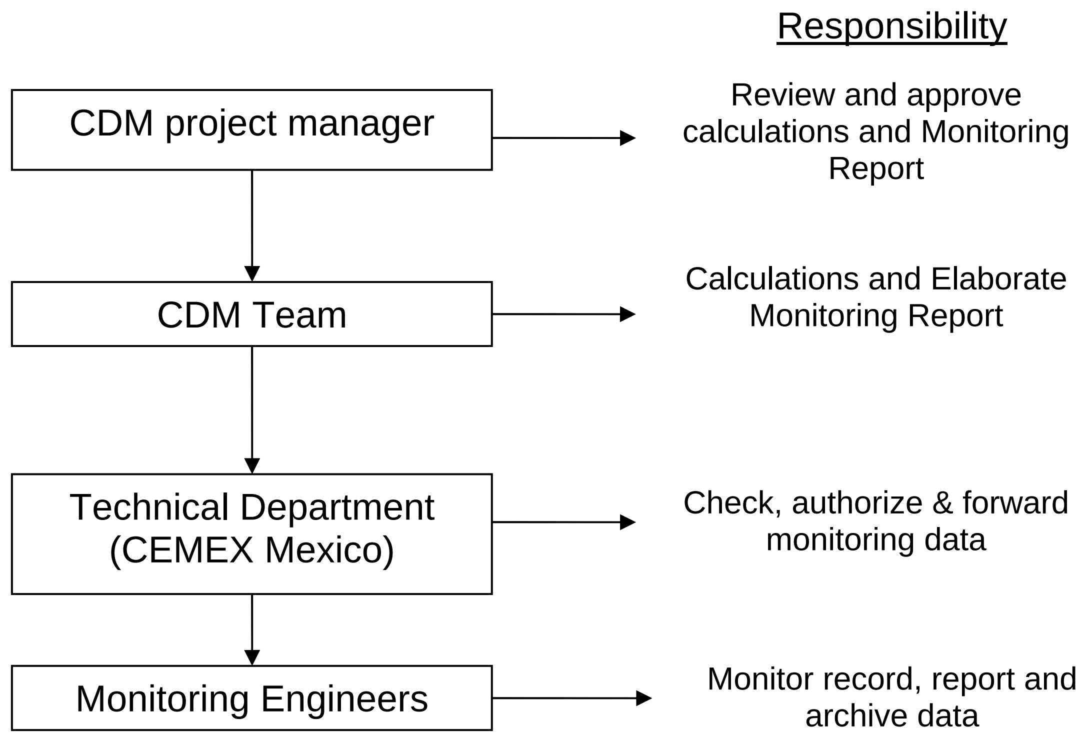
	Project Scenario	**Baseline Scenario**
Data / Parameter:	$P_{Blend,y}$	$B_{Blend,BSL}$
Data unit:	Tonne of clinker /tonne of blended cement.	Tonne of clinker /tonne of blended cement.
Description:	Share of clinker per tonne of blended cement.	Share of clinker per tonne of blended cement defined as benchmark of the Mexican market.
Source of data to be used:	Plants records	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See Annex 3.	See Annex 3.
Description of measurement methods and procedures to be applied:	Calculated by formulae: Clinker consumed / Blended cement produced. Recording frequency: Annually.	Calculated under the Approved Methodology ACM0005 and updated with an ex – ante trend. Recording frequency: Annually.
QA/QC procedures to be applied:		
Any comment:		

B.7.2 Description of the monitoring plan:

>>

The project meets the applicability criteria under the approved monitoring methodology ACM0005 Version 05 (“Consolidated Monitoring Methodology for Increasing the Blend Cement Production”).

This figure describes the operational and management structure that will monitor emissions reductions generated by the project activity. All data and calculation formula required to proceed is given in Section B.6.1 and B.7.1.



Emission Monitoring and Calculation Procedure	
Data Source and collection	Data are taken from Operations, Technical and Logistic Department for each cement plant.
	Most data are available and recorded according to the actual data management system (GrafOper and SICA).
	Frequency of data is based on actual data management system.
	Data are monitored by monitoring engineers for each cement plant. All data are reviewed by Technical Department.
Data compilation	All data from every plant is centralised at Monterrey.
	Data is transmitted to CDM Team
Emission calculation and Monitoring Report	Emission calculations are conducted on yearly basis from data which is collected daily, monthly or annually, depending on the nature of the data.
	All data is calculated by CDM Team, using a excel spreadsheet. Monitoring Report will be elaborated by CDM Team.
Emission data review and approval	Calculation and Monitoring Report is reviewed and approved by CDM project manager.
Record keeping	All data will be recorded electronically. Monitoring engineers are responsible for record keeping.

Table 9. Monitoring procedures.

B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

>>
Date of completion: June 2007

Alfonso Lanseros Valdés
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SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
01/01/2008.

C.1.2. Expected operational lifetime of the project activity:

>>
The operational lifetime of the project activity is estimated to about 25 years.

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

>>
N/A

C.2.1.2. Length of the first crediting period:

>>
N/A

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
01/01/2008[3]

C.2.2.2. Length:

>>
10 years

SECTION D. Environmental impacts

>>

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

>>
The project activity under consideration does not require any Environmental Authorization from the host country as it does not fall under the project category which requires mandatory EIA study for clearance. However the impact of the activity on the environment has been meticulously examined by the project proponent.

Direct reduction in GHG emissions: Clinker production is the main source of CO2 emission in cement production. By reducing the clinker content in the cement production the CO2 emissions are reduced proportionately due to reduction in the consumption of fossil fuels and calcinations emissions.

Disposal of industrial wastes: Fly ash is a waste product from thermal power plants. Fly ash, if not utilized, will result in severe environmental pollution. By increasing the utilization of fly ash these adverse affectations can be eliminated. Slag is an industrial waste from the steel industry. This waste would be disposed of in a sustainable manner in cement plants.

Resource conservation: The project activity conserves resources in the following way:

- Reduction in the quantity of limestone required for cement production.
- Reduction of fossil fuels used for cement production.

This resource conservation helps in sustainable development by:

- Reducing in quarry mining for limestone extraction.
- Reducing associated fugitive dust emissions.
- Reducing land destruction and erosions arising from such activities.

---

[3] Expected date for the project registration. The project activity starting date for the crediting period may change depending on the registration date at UNFCCC, the crediting period for the project will not commence prior to the date of registration.

- Reducing adverse health impacts caused from quarrying of materials on nearby habitats and ecosystem.

Thus, there are positive impacts from the project activity.

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

>>
Environmental impacts of the project activity are not considered significant by the project participants or the Host country.

SECTION E. Stakeholders' comments

>>

E.1. Brief description how comments by local stakeholders have been invited and compiled:

>>
Stakeholder comments have been obtained through two routes:

- National stakeholders: The project participant has interviewed the following authorities and entities:
  - CANACEM (*"Cámara Nacional de Cementos"*) has been informed of the project activity. CANACEM has expressed a positive global opinion since the project activity reduces GHG emissions and contributes to the sustainable development.
  - *Designated National Authority* (DNA). Under the terms proposed, the implementation of the project activity proposed will contribute to the Mexico's sustainable development. Promotion of these kinds of projects would be very interesting in Mexico. DNA has expressed directly about the sustainability of the project where they found that there are no related environmental risks. CEMEX Mexico has received The Letter of Project Approval from the DNA.
  - IMCYC (*Instituto Mexicano de Cemento y Concreto*). IMCYC had no objection to the development of the project activity. It was considered that clinker reduction remaining constant the cement quality will have to overcome multiple barriers. Also the IMCYC mentioned that the use of additives improve several qualities of the blended cement such as the durability and permeability increasing the cement lifetime.
  - Cement users such as architects and civil engineers were interviewed. Cement users have been informed of the project activity. They agree with the project development and they argued that the implementation of the project activity will result in several environmental and global benefits.

- Local stakeholders: the local stakeholder consultation process was carried out as follows:

  - CEMEX Mexico invited different groups from the local community for each cement plant: neighbours, personnel of the plant, local authorities, etc.
  - The project activity was presented to the local stakeholders.
  - After the presentation, doubts were cleared and CEMEX proceeded to give to each participant a questionnaire in which it was asked their opinion about the project, their concerns and if they agreed or not for CEMEX develop this project.

E.2. Summary of the comments received:

>>

All questions from the stakeholders were answered at the presentation. No objections have been received. The local stakeholders proposed several activities to CEMEX México to keep contributing with the GHG mitigation and the community environment improvement, some of these activities are:

- Courses and conferences about climate change and environmental problems
- Reforesting campaigns
- Waste water treatment
- Trash management
- Recycling campaigns
- More cleaning in plants
- Energy saving programs
- Residues reduction

E.3. Report on how due account was taken of any comments received:

>>

All comments received by the stakeholders were positive. CEMEX Mexico will considerate the activities proposed by the local stakeholders and will develop several programs with the local community in each plant.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	**CEMEX Mexico, S.A. de C.V.**
Street/P.O.Box:	Av. Constitución 444 Pte.
Building:	
City:	Monterrey
State/Region:	Nuevo Leon
Postfix/ZIP:	64000
Country:	Mexico
Telephone:	00 52 81 8328 3000
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E-Mail:	homero.ramirez@cemex.com
URL:	www.cemex.com
Represented by:	Homero Ramirez Tobias
Title:	
Salutation:	Mr.
Last Name:	Ramirez Tobias
Middle Name:	
First Name:	Homero
Department:	Technical Department
Mobile:	
Direct FAX:	00 52 81 8328 3293
Direct tel:	00 52 81 8328 3000
Personal E-Mail:	homero.ramirez@cemex.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

N/A

Annex 3

BASELINE INFORMATION

Note: Complete spreadsheets will be provided to the DOE.

Data Type	Source
Benchmark Analysis	
Cement Class 30R production per cement group	CANACEM
Installed capacity for cement production per cement group	Public information, newspapers, and cement group web page.
Clinker content in cement production in each cement group	IMCYC
Data on CEMEX cement plants	
Cement plant locations	CEMEX
Clinker production	Grafoper (CEMEX database)
Cement production	Grafoper (CEMEX database)
Fuels consumption	Grafoper (CEMEX database)
Electricity consumption	Grafoper (CEMEX database)
Additives content on cement production	Grafoper (CEMEX database)
CaO and MgO content in raw materials and clinker production	SICA (CEMEX database)
Leakage	
Fuel consumption	CEMEX
Distance	CEMEX
Load Capacity	CEMEX
Electricity Emission Factor	
Data required for calculations such as fuels consumption, generation sources, electricity production, etc.	CFE (Federal Commission of Electricity)

Benchmark Analysis:

Mexican cement companies

CEMEX Mexico
Company A
Company B
Company C
Company D
Company E

Company D has been excluded from the Benchmark Analysis because it does not face similar technical and market circumstances. An independent survey has been carried out by the *Instituto Tecnológico y de Estudios Superiores de Monterrey* to demonstrate that Company D is not comparable to the rest of cement market. This survey has been provided to the Designated Operational Entity.

<u>Grey Portland cements production in Mexican market:</u>

Company	Cement Class 30R production 2006 (tonnes)	Cement production 2006 (tonnes)
A	2.922.899	3.653.624
B	4.769.998	5.962.497
C	355.515	444.394
E	810.330	1.012.912
CEMEX	12.316.522	18.751.577
Total	21.200.062	29.825.004

Source: CANACEM (*Cámara Nacional de Cemento*); Cement Industry in Mexico "International Business Strategies"; CEMEX Mexico.

In Mexico most cement sales are done in 50-kilo package presentations (cement Class 30R). These sales by representatives account for over 80% of total sales (*International Business Strategies*). Therefore cement Class 30R production is estimated as 80% of Grey Cement Portland production.

Cement production data are not available by cement plant. Therefore to be conservative the maximum capacity has been assumed where clinker percentage is the lowest for each company.

Company	Cement production (tonnes)	Weighted average clinker content (%)	% of production (%)	Accumulated % of production (%)
CEMEX	12.369.240	78,41%	58,27%	**58,27%**
C	355.515	81,17%	1,67%	59,94%
A	2.922.899	82,15%	13,77%	96,18%
B	4.769.998	83,81%	22,47%	82,41%
E	810.330	88,06%	3,82%	100,00%

CEMEX Historical data analysis

	2004		2005		2006	
	Production (tBC)	% clinker	Production (tBC)	% clinker	Production (tBC)	% clinker
Atotonilco	708.560	70,44%	844.864	75,79%	894.732	78,39%
Barrrientos	119.855	73,90%	92.390	75,12%	128.248	79,08%
Campana	17.425	77,38%	48.123	75,89%	14.560	80,31%
Ensenada	323.183	73,20%	292.773	76,71%	327.968	76,63%
Guadalajara	550.364	70,76%	509.639	69,55%	457.167	68,71%
Hidalgo	0	0,00%	0	0,00%	0	0,00%
Huichapan	1.364.958	73,97%	1.716.150	75,64%	1.502.366	72,96%
Merida	659.334	81,68%	663.361	87,50%	784.326	87,58%
Monterrey	814.411	85,13%	805.396	84,63%	938.065	84,23%
Tamuín	1.636.577	81,26%	1.627.580	79,10%	1.515.591	82,87%
Tepeaca	1.457.957	71,11%	2.153.359	72,02%	2.746.497	74,18%
Torreón	757.044	85,66%	625.450	88,47%	647.042	88,70%
Valles	68.706	84,11%	12.463	88,43%	29.929	92,07%
Yaqui	1.168.128	77,73%	1.087.472	79,15%	1.097.114	81,57%
Zapotiltic	929.590	68,12%	1.044.820	68,13%	1.285.635	74,31%
CEMEX	10.576.092	76,43%	11.523.840	76,89%	12.369.240	78,41%

Baseline emissions:

- Option (i), 5 highest blend cement brands: **80,55%**.
- Option (ii), Top 20%: **78,41%**.
- Option (iii), mass percentage of clinker before the implementation of the CDM project activity: **76,43%**.

Projected clinker content at CEMEX Mexico`s plants, during the crediting period.

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Atotonilco (cement prodcution)	tBC	935.890	978.941	1.024.951	1.067.999	1.108.583	1.147.383	1.187.542	1.229.106	1.272.125	1.316.649
Atotonilco (clinker percentage)	%	74,36%	73,36%	72,36%	71,36%	70,36%	70,36%	70,36%	70,36%	70,36%	70,36%
Barrrientos (cement prodcution)	tBC	134.148	140.318	146.913	153.084	158.901	164.463	170.219	176.176	182.343	188.725
Barrrientos (clinker percentage)	%	78,34%	77,34%	76,34%	75,34%	74,34%	74,34%	74,34%	74,34%	74,34%	74,34%
Campana (cement prodcution)	tBC	15.230	15.930	16.679	17.380	18.040	18.672	19.325	20.001	20.701	21.426
Campana (clinker percentage)	%	77,60%	75,60%	73,60%	72,60%	71,60%	71,60%	71,60%	71,60%	71,60%	71,60%
Ensenada (cement prodcution)	tBC	343.055	358.835	375.700	391.480	406.356	420.578	435.299	450.534	466.303	482.623
Ensenada (clinker percentage)	%	68,44%	68,44%	68,44%	68,44%	68,44%	68,44%	68,44%	68,44%	68,44%	68,44%
Guadalajara (cement prodcution)	tBC	478.196	500.193	523.703	545.698	566.435	586.260	606.779	628.016	649.997	672.747
Guadalajara (clinker percentage)	%	65,39%	64,39%	63,39%	62,39%	62,39%	62,39%	62,39%	62,39%	62,39%	62,39%
Hidalgo (cement production)	tBC	8.000	8.368	8.761	9.129	9.476	9.808	10.151	10.506	10.874	11.255
Hidalgo (clinker percentage)	%	80,00%	78,00%	77,00%	77,00%	77,00%	77,00%	77,00%	77,00%	77,00%	77,00%
Huichapan (cement prodcution)	tBC	1.571.475	1.643.763	1.721.019	1.793.302	1.861.448	1.926.598	1.994.029	2.063.820	2.136.054	2.210.816
Huichapan (clinker percentage)	%	69,59%	68,59%	67,59%	67,59%	67,59%	67,59%	67,59%	67,59%	67,59%	67,59%
Merida (cement prodcution)	tBC	820.406	858.144	898.477	936.213	971.789	1.005.802	1.041.005	1.077.440	1.115.150	1.154.181
Merida (clinker percentage)	%	81,69%	79,69%	77,69%	76,69%	76,69%	76,69%	76,69%	76,69%	76,69%	76,69%
Monterrey (cement prodcution)	tBC	981.216	1.026.352	1.074.590	1.119.723	1.162.272	1.202.952	1.245.055	1.288.632	1.333.734	1.380.415
Monterrey (clinker percentage)	%	79,72%	78,72%	77,72%	76,72%	76,72%	76,72%	76,72%	76,72%	76,72%	76,72%
Tamuín (cement production)	tBC	1.585.308	1.658.232	1.736.169	1.809.088	1.877.833	1.943.557	2.011.582	2.081.987	2.154.857	2.230.277
Tamuín (clinker percentage)	%	78,03%	77,03%	76,03%	76,03%	76,03%	76,03%	76,03%	76,03%	76,03%	76,03%
Tepeaca (cement prodcution)	tBC	2.872.836	3.004.987	3.146.221	3.278.362	3.402.940	3.522.043	3.645.314	3.772.900	3.904.952	4.041.625
Tepeaca (clinker percentage)	%	73,15%	72,15%	71,15%	71,15%	71,15%	71,15%	71,15%	71,15%	71,15%	71,15%
Torreón (cement prodcution)	tBC	676.806	707.939	741.212	772.343	801.692	829.752	858.793	888.851	919.960	952.159
Torreón (clinker percentage)	%	82,51%	80,51%	79,01%	79,01%	79,01%	79,01%	79,01%	79,01%	79,01%	79,01%
Valles (cement prodcution)	tBC	31.306	32.746	34.285	35.725	37.083	38.380	39.724	41.114	42.553	44.042
Valles (clinker percentage)	%	92,07%	92,07%	92,07%	92,07%	92,07%	92,07%	92,07%	92,07%	92,07%	92,07%
Yaqui (cement prodcution)	tBC	1.147.581	1.200.370	1.256.787	1.309.572	1.359.336	1.406.913	1.456.155	1.507.120	1.559.869	1.614.465
Yaqui (clinker percentage)	%	77,91%	75,91%	74,91%	74,91%	74,91%	74,91%	74,91%	74,91%	74,91%	74,91%
Zapotiltic (cement prodcution)	tBC	1.344.774	1.406.634	1.472.745	1.534.601	1.592.915	1.648.668	1.706.371	1.766.094	1.827.907	1.891.884
Zapotiltic (clinker percentage)	%	69,87%	68,87%	67,87%	67,87%	67,87%	67,87%	67,87%	67,87%	67,87%	67,87%

Emission reductions calculations:

		Base year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Pblend CEMEX Mexico	%	78,41%	74,71%	73,53%	72,47%	72,21%	72,13%	72,13%	72,13%	72,13%	72,13%	72,13%
BCy CEMEX Mexico	tonBC/año	12.300.565	12.877.550	13.473.077	14.109.539	14.705.024	15.266.425	15.803.153	16.358.667	16.933.624	17.528.705	18.144.613
Bblend,y	%	76,43%	76,43%	75,95%	75,48%	75,01%	74,54%	74,07%	73,60%	73,12%	72,65%	72,18%
Ablend,y	%	23,57%	23,57%	24,05%	24,52%	24,99%	25,46%	25,93%	26,40%	26,88%	27,35%	27,82%
BE clinker	tCO2/tClinker	0,919										
PE clinker	tCO2/tClinker		0,919	0,919	0,919	0,919	0,919	0,919	0,919	0,919	0,919	0,919
BE clinker conservative	tCO2/tClinker		0,919	0,919	0,919	0,919	0,919	0,919	0,919	0,919	0,919	0,919
BE_ele_ADD_BC	tCO2/tBC	0,027										
PE_ele_ADD_BC	tCO2/tBC		0,027	0,027	0,027	0,027	0,027	0,027	0,027	0,027	0,027	0,027
BE_ele_ADD_BC conservative	tCO2/tBC		0,027	0,027	0,027	0,027	0,027	0,027	0,027	0,027	0,027	0,027
BE_BC,y	tCO2e/tonBC	0,741	0,730	0,726	0,721	0,717	0,713	0,708	0,704	0,700	0,695	0,691
PE_BC,y	tCO2e/tonBC		0,714	0,703	0,694	0,691	0,691	0,691	0,691	0,691	0,691	0,691
Emission reductions												
Baseline emissions	tCO2		9.401.370	9.777.741	10.178.479	10.544.318	10.880.701	11.194.740	11.517.353	11.848.754	12.189.165	12.538.809
Project emissions	tCO2		9.198.377	9.477.958	9.787.972	10.165.930	10.542.275	10.912.914	11.296.526	11.693.564	12.104.499	12.529.816
Leakage emissions	tCO2		-2.623	-3.874	-5.047	-4.890	-4.374	-3.642	-2.854	-2.006	-1.094	-116
ERy Emission reductions	tCO2e/año		200.370	295.909	385.461	373.497	334.053	278.184	217.973	153.184	83.571	8.877
ERy Emission reductions (10 years)	2.331.078	tCO2e										

Project and Baseline Emission Factors[4]

Emission Factor	Clinker production	Cement production	BE_Fossil Fuel	BE grid clinker	BE Calcin clinker	BE grid Grinding	BE grid additives	BE clinker	BE_BC
Plant	Ton Clinker/year	Ton cement/year	TnCO2/Tn Clinker	TnCO2/Tn Clinker	TnCO2/Tn Clinker	TnCO2/Tn BC	TnCO2/Tn BC	TnCO2/Tn Clinker	TnCO2/tBC
Atotonilco	1.092.791	1.334.948	0,36	0,047	0,525	0,029	0,00005	0,934	0,761
Barrientos	741.149	1.061.780	0,35	0,058	0,529	0,040	0,000	0,942	0,785
Campana	1.649.019	1.720.256	0,36	0,042	0,534	0,031	0,000	0,934	0,780
Ensenada	496.691	657.496	0,38	0,039	0,527	0,042	0,000	0,945	0,766
Guadalajara	736.705	976.681	0,32	0,056	0,520	0,033	0,000	0,901	0,652
Hidalgo	189.167	178.008	0,35	0,046	0,532	0,000	0,000	0,928	0,000
Huichapan	2.165.017	3.095.496	0,34	0,048	0,538	0,026	0,000	0,928	0,703
Mérida	647.647	795.581	0,37	0,044	0,533	0,023	0,000	0,943	0,848
Mty Gris	1.474.117	1.563.818	0,36	0,042	0,524	0,025	0,000	0,925	0,804
Taquín	1.295.075	1.802.271	0,32	0,041	0,523	0,023	0,000	0,883	0,755
Tepeaca	2.410.192	3.257.799	0,33	0,034	0,532	0,026	0,00012	0,896	0,691
Torreon	1.086.829	1.260.011	0,36	0,044	0,519	0,025	0,000	0,924	0,844
Valles Gris	86.718	90.673	0,46	0,061	0,536	0,026	0,000	1,060	1,002
Yaqui	1.076.789	1.365.880	0,33	0,042	0,523	0,024	0,000	0,893	0,752
Zapotiltic	1.457.701	1.818.654	0,37	0,037	0,525	0,029	0,000	0,930	0,720
Average/Total	16.605.607	20.979.352		0,043	0,528	0,027	0,000022	0,919	0,741

[4] Project emission factor has been estimated the same as the baseline emission factor. The project emission factor will be monitored.

Leakage: [5]

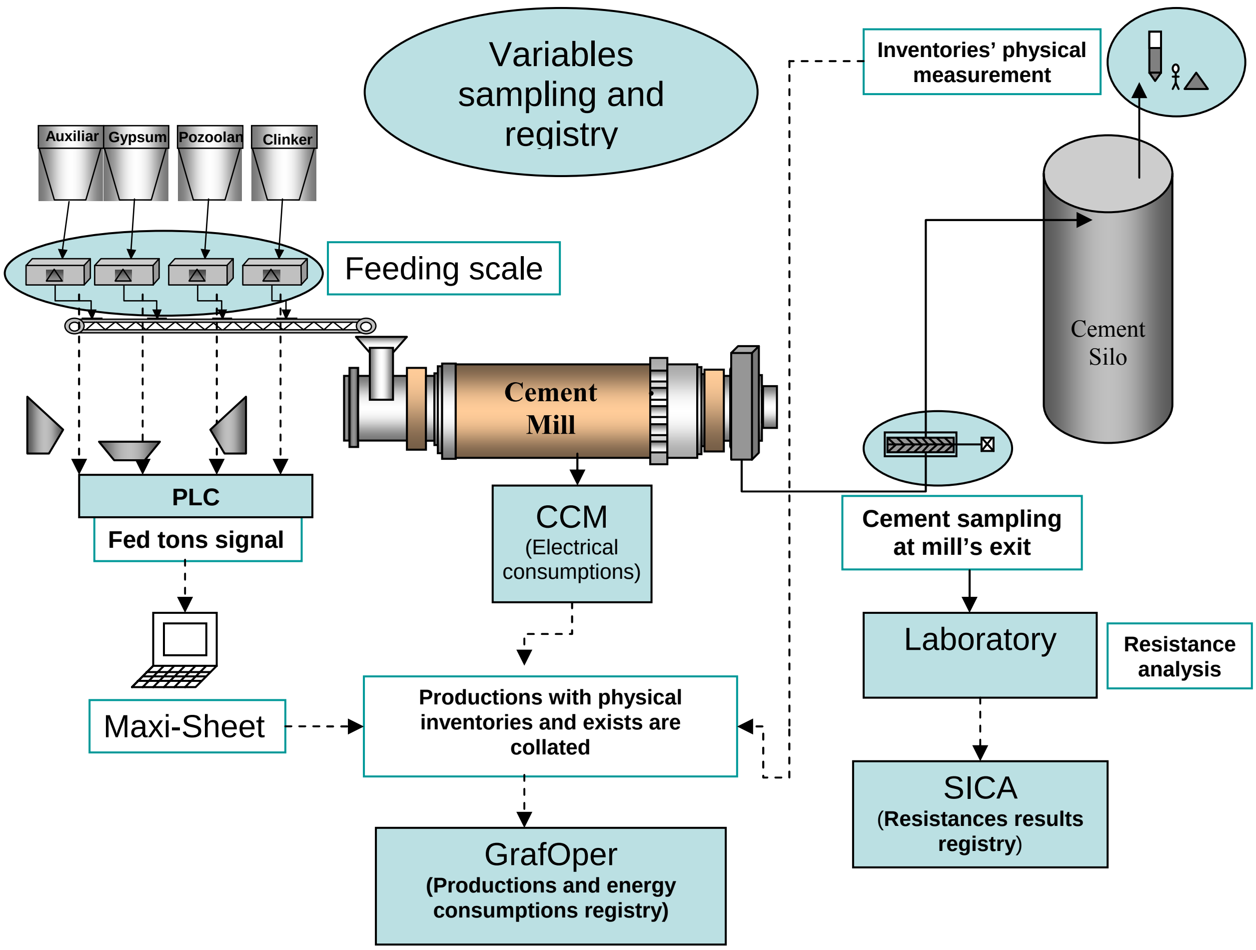
	Transport capacity	Trip distance	Transport type	Ladd_trans	TF_cons	TEF
	ton/veh	Km/veh		tCO2/ton add	kgfuel/km	kgCO2/kgfuel
Atotonilco	80,00	1,00	Truck	0,0000	0,41	3,21
Barrrientos	4.590,00	48,00	Train	0,0004	11,25	3,21
	80,00	1,00	Truck	0,0000	0,41	3,21
Campana	0,00	0,00	NA	0,0000	0,00	3,21
Ensenada	5.000,00	45,00	Ship	0,0003	10,00	3,21
	80,00	7,00	Truck	0,0001	0,41	3,21
Guadalajara	80,00	50,00	Truck	0,0008	0,41	3,21
	80,00	111,00	Truck	0,0018	0,41	3,21
Hidalgo	0,00	0,00	NA	0,0000	0,00	3,21
Huichapan	0,00	0,00	NA	0,0000	0,00	3,21
Merida	4.590,00	1.510,00	Train	0,0119	11,25	3,21
	80,00	2,00	Truck	0,0000	0,41	3,21
Monterrey	80,00	16,00	Truck	0,0003	0,41	3,21
Tamuín	0,00	0,00	NA	0,0000	0,00	3,21
Tepeaca	0,00	0,00	NA	0,0000	0,00	3,21
Torreón	0,00	0,00	NA	0,0000	0,00	3,21
Valles	0,00	0,00	NA	0,0000	0,00	3,21
Yaqui	0,00	0,00	NA	0,0000	0,00	3,21
Zapotiltic	0,00	0,00	NA	0,0000	0,00	3,21

[5] The maximum L_{add_trans} factor has been assumed to calculate leakage emissions as a conservative manner.

Annex 4

MONITORING INFORMATION

The following figure describes the necessary equipments to meter the variables defined in Section B.7.



Annex 5

ELECTRICITY EMISSION FACTOR[6]

Total Fuel consumption:

2003: 1.608.190 TJ
2004: 1.537.745 TJ
2005: 1.597.605 TJ

	2003			
	Fuel share	Fuel consumption (TJ)	Carbon content (tC/TJ)	Emission CO_2 (tCO_2)
Fuel Oil	42,20%	678.656	21,1	52.505.366
Natural Gas	37,00%	595.030	15,3	33.381.200
Diesel	1,60%	25.731	20,2	1.905.812
Coal	19,20%	308.772	25,8	29.209.877
Total	100%	1.608.190		117.002.255

Fuel consumption per fuel type. Source: *Prospectiva del sector eléctrico 2004-2013 Gráfica 22 p.72*.

	2004			
	Fuel share	Fuel consumption (TJ)	Carbon content (tC/TJ)	Emission CO_2 (tCO_2)
Fuel Oil	41,10%	632.013	21,1	48.896.754
Natural Gas	42,60%	655.079	15,3	36.749.953
Diesel	1,00%	15.377	20,2	1.138.956
Coal	15,30%	235.275	25,8	22.257.014
Total	100%	1.537.745		109.042.677

Fuel consumption per fuel type. Source: *Prospectiva del sector eléctrico 2005-2014 Gráfico 30 p.82*.

	2005			
	Fuel share	Fuel consumption (TJ)	Carbon content (tC/TJ)	Emission CO_2 (tCO_2)
Fuel Oil	39,10%	624.664	21,1	48.328.137
Natural Gas	39,50%	631.054	15,3	35.402.128
Diesel	0,90%	14.378	20,2	1.064.963
Coal	20,50%	327.509	25,8	30.982.354
Total	100%	1.597.605		115.777.582

Fuel consumption per fuel type. Source: *Prospectiva del sector eléctrico 2006-2015 Gráfico 31 p.90*.

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[6]The documents used as source data for the electricity emission factor are located in the following websites:

- http://www.energia.gob.mx/webSener/portal/index.jsp?id=48
- www.cfe.gob.mx/NR/rdonlyres/D4DC6216-B657-4891-842C-2013613CF3DD/0/POISE20022011.pdf

Generation by sources:

	2003		2004		2005	
	Power share	Annual Generation (GWh)	Power share	Annual Generation (GWh)	Power share	Annual Generation (GWh)
Dual	6,80%	13.842	3,80%	7.928	6,50%	14.233
Combined cycle	27,00%	54.960	34,70%	72.396	33,50%	73.355
Gas turbine	3,40%	6.921	1,30%	2.712	0,60%	1.314
Coal	8,20%	16.692	8,60%	17.943	8,40%	18.394
Internal	0,00%	0	0,30%	626	0,40%	876
Nuclear	5,20%	10.585	4,40%	9.180	4,90%	10.730
Standard Thermoelectric	36,60%	74.501	31,80%	66.346	29,70%	65.034
Renewables (Hydro, Geo, Wind …)	12,80%	26.055	15,10%	31.504	15,90%	34.816
Total	100%	203.555	100%	208.634	100%	218.971

Generation by sources. Source: Sener. "*Prospectiva del sector eléctrico 2006-2015 Gráfico 30 p.89"; "Prospectiva del sector eléctrico 2005-2014 Gráfico 29 p.81";* and *"Prospectiva del sector eléctrico 2004-2013 Gráfica 21 p.71"*

Total % under methodology		
2003	2004	2005
18,00%	19,50%	20,80%

Total generation in baseline (GWh)		
2003	2004	2005
166.915	167.950	173.206

Imports (GWh)		
2003	2004	2005
71,0	47,0	87,0

Imports. Source: Sener. "*Prospectiva del sector eléctrico 2006-2015 Cuadro 12 p.55"*

Baseline calculations:

- Operating Margin:

Operating Margin = total CO_2 emission / (total generation under baseline + imports)

Operating Margin 2003 = 117.002.255/ (166.915 + 71) = 700,7 tCO_2/GWh
Operating Margin 2004 = 109.042.677 / (167.950 + 47) = 649,1 tCO_2/GWh
Operating Margin 2005 = 115.777.582 / (173.206 + 87) = 668,1 tCO_2/GWh

OM = (700,7 * (166.915 + 71) + 649,1*(167.950 + 47) + 668,1* (173.206 + 87)) / ((166.915 + 71) + (167.950 + 47) + (173.206 + 87)) = **672,5 tCO_2/GWh**

- Build Margin:

Calculation of Build Margin:

Build Margin = (Fuel consumption (TJ) * Fuel emission factor (tCO_2/TJ)) / (Total annual generation of the last newest plants that comprise 20% of total generation (GWh_e))

Fuel consumption = 3,6 TJ/GWh_{therm} * (Annual Generation (GWh_e) / Efficiency (GWh_e/GWh_{therm}))

Fuel emission factor (tCO_2/TJ) = Carbon content (tC/TJ) * (44/12)

Plant name	Technology	Capacity (MW)	Annual generation (GWh)	Efficiency (%)	Fuel type	Cumulative percentage (%)	Fuel consumption (TJ)
Additions 2005							
Hol Box	IC	0,8	1,20	47,61	DI	0,0%	0,1
La Laguna II	CC	498	2.754	52,58	NG	1,3%	188,6
Rio Bravo IV	CC	500	1.886	52,58	NG	2,1%	129,1
Botello	Hydro	9	40	90	na	2,1%	1,6
Baja California Sur I	IC	42,9	121	47,61	DI	2,2%	9,2
Yécora	IC	0,7	0,40	47,61	DI	2,2%	0,0
Ixtaczoquitlán	Hydro	1,6	3,30	90	na	2,2%	0,1
Hermosillo	CC	93,3	0	52,58	NG	2,2%	0,0
Additions 2004							
Chicoasén (Manuel Moreno Torres)	Hydro	900	593	90	na	2,5%	23,7
Rio Bravo III (PIE)	CC	495	1.717	52,58	NG	3,2%	117,6
El Sauz*	CC	128	849	52,58	NG	3,6%	58,1
Tuxpan (Pdte. Adolfo López Mateos)	GT	163	54	38,08	NG	3,7%	5,1
San Lorenzo Potencia	GT	266	214,00	38,08	NG	3,8%	20,2
Guerrero Negro II	IC	10,8	41,30	47,61	DI	3,8%	3,1
Additions 2003							
Los Azufres	Geo	106,6	350	30	na	3,9%	42,0
Calera (bloque) (Arrendamiento)	IC	0	0	47,61	DI	3,9%	0.0
El Verde (Arrendamiento)	GT	0	0	38,08	NG	3,9%	0.0
Las Cruces (Arrendamiento)	GT	0	0	38,08	NG	3,9%	0.0
Dos Bocas (bloque) (Arrendamiento)	GT	0	0	38,08	NG	3,9%	0.0
Tuxpan III y IV (PIE)	CC	983	5.464	52,58	NG	6,4%	374,1

Altamira III y IV (PIE)	CC	1036	5.932	52,58	NG	9,1%	406,1
Mexicali (PIE)	CC	489	2.191	52,58	NG	10,1%	150,0
Transalta Campeche (PIE)	CC	252,4	1.782	52,58	NG	11,0%	122,0
Naco Nogales (PIE)	CC	258	1.819	52,58	NG	11,8%	124,5
Transalta Chihuahua III (PIE)	CC	259	1.100	52,58	NG	12,3%	75,3
Additions 2002							
Hol Box	IC	0,8	1,6	47,61	DI	12,3%	0,1
Bajío	CC	565	4.698	52,58	NG	14,4%	321,7
Altamira II	CC	495	3.083	52,58	NG	15,8%	211,1
Río Bravo II	CC	495	2.279	52,58	NG	16,9%	156,1
Monterrey III	CC	449	3.147	52,58	NG	18,32%	215,5
Valle de México	GT/CC	249,3	1.610	52,58	NG	19,06%	110,2
El Sauz	GT/CC	129	887	52,58	NG	19,46%	60,7
El Encino	GT	130,8	134	38,08	NG	19,52%	12,6
Additions 2001							
Tres Vírgenes	GEO	10	37	30	na	19,54%	4.4
Saltillo (PIE)	CC	248	1.432	52,58	GAS	20,19%	98,0
Chihuahua II (El Encino)	CC	554	3.053	52,58	GAS	21.59%	209,0
Presidente Juárez	CC	1026	3.772	52,58	COM y GAS	23,31%	258,3
Hermosillo (PIE)	CC	250	1.316	52,58	GAS	23,91%	90,1
Tuxpan II (PIE)	CC	495	3.397	52,58	GAS	25,46%	232,6
El Verde		0	0		0	25,46%	
Puerto San Carlos	IC	104	586	47,61	COM y DIE	25,73%	44,3

New power plants installed. Source: Sener. "*Prospectiva del sector eléctrico 2006-2015 Cuadro 13 p.57; Prospectiva del sector eléctrico 2005-2014 Cuadro 14 p.51; Prospectiva del sector eléctrico 2004-2013 Cuadro 9 p.44* and *Prospectiva del sector eléctrico 2003-2012 Cuadro 8 p.39*", CFE. "*Programa de Obras e Inversiones del Sector Eléctrico 2002-2011 p.2-4" and 2005 Generation data provided by CFE Planning Department.* Abbreviations: Hydro: hydropower plant; Geo: geothermal plant, CC: combined cycle plant, fuelled with natural gas, GT: Gas turbine, fuelled with natural gas. IC: Internal combustion.

BM factor: **377,20** tCO_2/GWh

Emission factor ex-ante = 0,5*OM+ 0,5*BM = **524,86** tCO_2/GWh