CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02 - in effect as of: 1 July 2004)

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

Title: "Increasing the Additive Blend in the Portland Slag Cement manufacturing" by Indorama Cement Ltd.

Version: Ver. 1.0
Date: 31.10.2005

A.2. Description of the project activity:

Indorama Cement Ltd. (IRCL) belongs to US$600 million Indorama SPL group having diversified business interests in chemical, textile and cements. IRCL has a cement manufacturing capacity of 0.95 MTPA at Raigad, Maharastra. IRCL is catering to cement demand in western India (mainly to state of Maharastra).

The project activity produces Portland Slag Cement (PSC) with higher slag content beyond the current practices in the region. PSC is manufactured by blending clinker with the ground granulated blast furnace slag procured from nearby steel industries along with other additives. The addition of slag in cement replaces clinker and thus helps industry to cut down on energy (thermal & electrical) consumptions in clinker production which is the most energy intensive process in the cement production. The project activity is the first in the western India region and the only one in the state of Maharashtra producing PSC.

The project activity results in Green House Gases (GHG) emissions reduction due to following –

- Reduction in CO2 emissions associated with fossil fuel burning in kilns for clinker production
- Reduction in CO2 emissions associated with electricity consumption in clinker production
- Reduction in emissions associated with calcination of raw material to produce clinker in the kilns
- Reduction in CO2 emissions associated with electricity consumption in grinding of clinker

Though certain properties of PSC are superior to that of Ordinary Portland Cement (OPC)-the commonly sold cement in the country, IRCL had to face stiff challenge from cement producers in Maharashtra and from other adjoining states. The market is not very open to using PSC and looks at it as something of inferior quality. IRCL invested heavily in its market promotion along with the R&D done to make it more market acceptable[1]. The project proponent has created an in-house cell of technical experts and has also availed the services of known national and international consultants to create awareness about the PSC use in various applications. The technical cell also provides solutions to specific issues faced by consumers.

Contribution towards sustainability development by project activity

The project activity helps in the sustainable development on following accounts –

Social well being:

[1] See annex 5 for details

The project activity provides employment opportunities to the populace both in the transportation of the additives and processing inside the plant.

India is facing power shortage; reduced energy consumption per ton of cement produced would lead to availability of energy for other economic activities.

Economic well being:
Apart from employment generation in the plant; the project activity would promote the use of PSC further and bring in more companies to come up with PSC production resulting into additional generation of employment and investments in the state. There are a number of steel industries in the state of Maharashtra and there is a lot of opportunity for the cement industry to use the waste slag in PSC manufacturing.

Environmental well being:
The use of slag in PSC production helps environment in a number of ways;

- Conservation of valuable natural resources of raw material used in cement production i.e. limestone, coal etc.
- GHG emissions reduction associated with cement production
- Solving the problem of slag disposal from the steel industries

Technological well being:
The plant is using first of its kind UBE VRMs (Vertical roller mill) from Japan. Though the technology for PSC production is not much different to that used in OPC production however the project proponent invested heavily in its promotion to make the consumer more aware & in R&D to make it suitable to the end applications.

A.3. Project participants:

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)
Government of India	Indorama Cement Ltd.	No
	Emergent Ventures India Pvt Ltd	

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

India

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

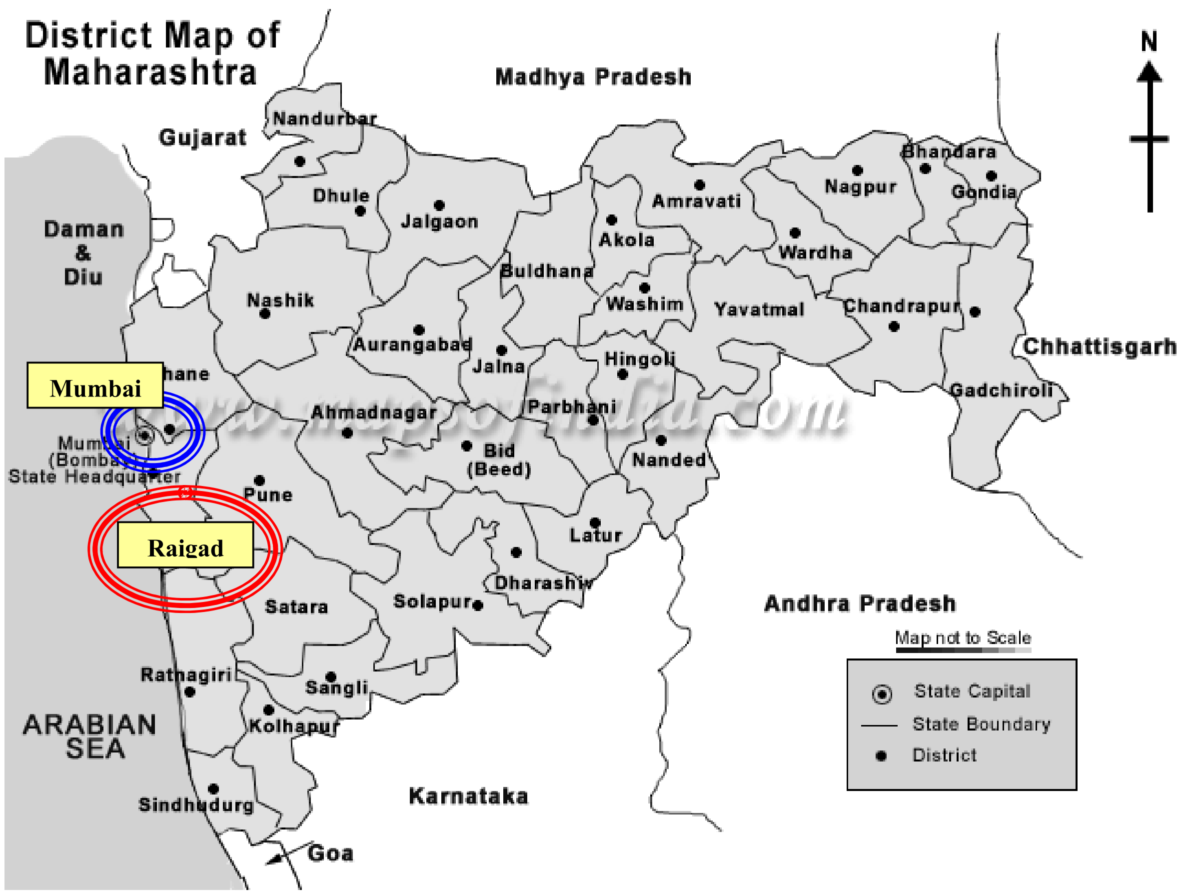
State of Maharashtra

A.4.1.3. City/Town/Community etc:

Village : Khar Karvi
Taluka : Pen
District: Raigad

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

The plant is situated at Khar Karvi near Pen in Raigad district, about 75 km from Mumbai in Maharashtra.



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

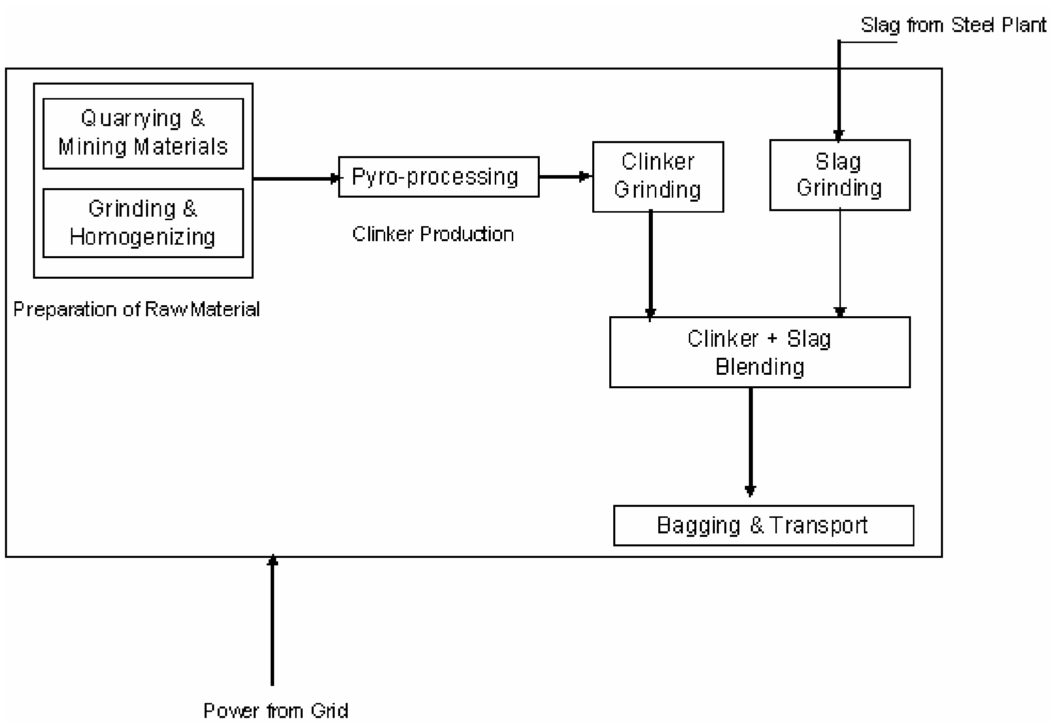
The project activity is a cement sector specific project activity. The project activity is categorized in Category 4: Manufacturing Industries.

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

The project activity produces Portland Slag Cement (PSC) by blending clinker and slag[2] along with other additives. The slag is bought from nearby steel plants and clinker is bought from a number of plants primarily from the states of Gujarat & Karnataka.

The manufacturing process for PSC production is as follows –

- Procurement of clinker, slag and other additives
- Separate grinding of clinker & slag
- Intimate blending of ground clinker & slag
- Packing & forwarding



The project activity uses the first of its kind UBE Vertical Roller Mill (VRM) from Japan for PSC.

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

The project activity results in GHG emissions reduction due to following –

- Reduction in CO2 emissions associated with fossil fuel burning in kilns for clinker production

[2] Slag is a obtained from blast furnaces of steel and Ferro alloys industries. According to regulations in India Slag used in production of PSC should conform to IS:12089, 1987

- Reduction in CO2 emissions associated with electricity consumption in clinker production
- Reduction in emissions associated with calcination of raw material to produce clinker in the kilns
- Reduction in CO2 emissions associated with electricity consumption in grinding of clinker

The project activity of increasing slag content in the cement is not a business as usual case as evident by absence of any other cement manufacturer producing PSC in the region. The project activity is the only plant producing PSC in western region of India, Also the market acceptability for PSC is poor. IRCL is investing substantially in developing technologically superior PSC and in market promotions to remove the barriers for PSC. IRCL has employed dedicated external experts other than their own team of technical experts. IRCL has also taken consultancy services from various international experts in slag cement for conducting seminars and workshops in the region.

In the absence of the project activity the usage of slag in PSC would have remained at a low level (similar to existing practices) leading to GHG emissions.

The estimated total reduction in tonnes of CO2 equivalent over the crediting period of 7 years = 300,169 tCO2e for the first crediting period

A.4.4.1. Estimated amount of emission reductions over the chosen crediting period:

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Years	Annual estimation of emission reductions in tones of CO2 e
April 2002-Mar 2003	26139.5
April 2003-Mar 2004	10876.7
April 2004-Mar 2005	30212.0
April 2005-Mar 2006	65090.2
April 2006-Mar 2007	60580.7
April 2007-Mar 2008	55981.0
April 2008-Mar 2009	51289.3
Total estimated reductions (tonnes of CO2 e**)**	300,169
Total number of crediting years	7 years (first crediting period, twice renewable)
Annual average over the crediting period of estimated reductions (tonnes of CO2e**)**	42881.4

A.4.5. Public funding of the project activity:

No public funding involved in the project activity.

SECTION B. Application of a baseline methodology

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

Approved Methodology: ACM0005, "Consolidated Methodology for Increasing the Blend in Cement Production"

Version: 01; 30th September 2005

B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

The baseline methodology applies to cement manufacturing industries that aims to increase the share of additive (blast furnace slag in the project activity) in the production of Portland Slag Cement (PSC) beyond current practices in the region.

The position of the CDM project activity of IRCL vis-à-vis applicability conditions in the ACM 0005/Verson01 is described in the following table.

Applicability Criteria in the AM0005/Version01	Position of the project activity vis-à-vis applicability criteria
There is no shortage of additives to prevent leakage related to the lack of blending materials. Project participants should demonstrate that there is no alternative allocation or use for the 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.	The slag produced in the blast furnaces of the steel industries is a waste and the quantity used for the project activity is surplus and is not cut off from other use areas. It is dumped in open lands creating severe environmental hazards. IRCL has contract for 20 years with the steel industries for supplying slag. Currently slag produced in the steel industry doesn't have any commercial use except for using it as additive in cement. Otherwise it is dumped in wasteland.
This methodology is applicable to domestically sold output of the project activity plant and excludes export of blended cement types.	Only domestic sale of PSC is considered in the project activity emissions reduction.
Adequate data are available on cement types in the market.	Adequate data are available in the public forum for the project activity.

B.2. Description of how the methodology is applied in the context of the project activity:

The project activity is based on consolidated methodology ACM0005 "Consolidated Baseline Methodology for Increasing the Blend in Cement Production". Following is the step-wise detail for determining baseline scenario for the project activity.

Step1: Selection of the "Region"

IRCL was the first company in western region to start manufacturing of PSC. It still is the only company producing PSC in the state of Maharashtra. It sells 95 % of its domestic overall sales of PSC in Maharashtra only.

According to approved methodology ACM0005, the project activity should meet following conditions as criteria for selection of the "region"–

Criteria

1. At least 75% of project activity's cement production is sold (% of domestic sales only) in the region

2. It includes at least 5 other plants with the required published data
3. The production in the region is at least four times the project activity's output

Status for project activity
1. IRCL sells almost 95% of its PSC produce in the state of Maharashtra
2. IRCL is the only plant in the state of Maharashtra producing PSC

There are following scenarios for IRCL to determine the "region" for the project activity –

SN	Region	Applicability Criteria Test	Remarks
1	"Maharashtra State"	It does not meet the criteria 2 & 3	Excluded
2	"Western Region"- As defined by Cement Manufacturer's Association (CMA) of India- (Gujarat and Maharastra states are included)	It does not meet the criteria 2 & 3	Excluded
3	"Western Region and Gulbarga & Chandrapur clusters" – Clusters[3] are defined by CMA (These clusters are included as cement produced here is supplied to state of Maharastra as well)	It does not meet criteria 2 & 3	Excluded
4	"Maharashtra & its adjoining states i.e. Maharashtra, Gujarat, Madhya Pradesh, Karnataka, Andhra Pradesh, Chattisgarh"	Meets all the 3 applicability criteria	Cement being bulk commodity, involves high freight costs for transportation. So, proximity to the market and availability of raw material and fuel are two deciding factors for choosing a plant location for a cement plant in India. Cement produced in the adjoining states is sold to nearby areas. Selected as the "Region" for the project activity
5	"National Region"	This is the default option as per "ACM0005"	India being a large country with diversity in nature of cement demand and supply can not be taken as region. Situation prevailing in distant region which are not supplying to the nearby

[3] Cement being bulk commodity, involves high freight costs for transportation. So, proximity to the market and availability of raw material and fuel are two deciding factors for choosing a plant location for a cement plant in India. This makes cement production regionalized with manufacturing units concentrated in specific locations called clusters. Cement Manufacturers' Association, the Apex body of Cement Manufacturers in India, defines seven clusters in India. These seven clusters meet about half of the total cement demand in India.

			areas can not taken as the scenario for the region hence this option is excluded. Also according to CMA statistics there is not much inter-regional movement of cement between Maharashtra and states not selected in the above region.

There are only two scenarios 4&5 which fulfil all the applicability criteria for the selection of region. The project activity has considered "Scenario 4" the "region" applicable for project activity as cement is always sold very close to its place of generation.

Step 2: Benchmark for baseline emissions

There are in total 14 PSC producing plants in the "region" as per the Cement Manufacturer's Association's (CMA) Cement Statistics: 2002. The PSC brands sold in the defined region have different levels of slag percentages. The additive percentage in these cements has been estimated based on the CMA published data and actual plant data.

As per ACM0005/version01, the benchmark for baseline emissions is defined as the lowest value among the following:

- The average (weighted by production) mass percentage of clinker for the 5 highest blend cement brands for the relevant cement type in the region;

Case 1	
Plant	**% clinker in PSC estimated based on Annual reports**
Weighted average of Clinker in PSC - Top 5 Plants	**54.9%**

- The production weighted average mass percentage of clinker in the top 20% (in terms of share of additives) of the total production of the blended cement type in the region;

Case 2	
Plant	**% clinker in PSC estimated based on Annual reports**
Weighted average of Clinker in PSC - Top 20 % Plants	**51.4%**

- 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.

Case 3	
Plant	**% clinker in PSC from IRCL**
Minimum of the % Clinker in PSC for most recent years	**56.8%**

Baseline benchmark is chosen as 51.4% Clinker percentage in the Blended cement. Clinker percentage is lowest in the third option (highest additive percentage in the project activity).

Option 2 is applicable as baseline benchmark for the project activity; an increasing trend of a minimum of 2% increase in additives over the percentage of additives at the start of the project activity is incorporated.

B.3. 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:

In the absence of the project activity, the current additive mix would have continued or even would have come down due to the poor market acceptability to using PSC.

The additionality of the project activity is shown by using the "*Tool for Demonstration and Assessment of additionality*".

Step 0: Preliminary screening based on the starting date of the project activity

The project activity was conceptualised in 2002-03. The evidence of consideration of CDM benefits from the time of conceptualization, and the continued effort made by the management to get CDM benefits right from the project start date would be shared with the DOE during validation

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

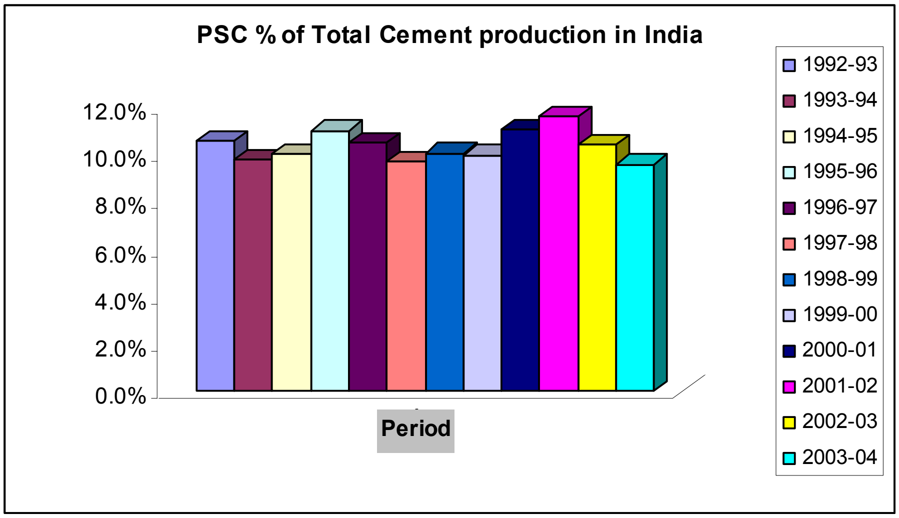
Sub-step 1a: Define alternatives to the project activity

1. *Increase in the slag percentage in production of PSC without CDM registration*

   The market acceptability for PSC is not good in India as these cements are considered as of poor quality. Though the cement industry has grown in the last decade or so but this growth has not reflected into growth for PSC. As shown in the following chart, the share of slag blends in the total production has actually dropped.[4] The increase in the slag percentage in Portland Slag

[4] CMA's Cement Statistics 2004

Cement is possible only if these barriers are removed by sustained efforts in market promotions and R&D.



CMA's Cement Statistics: 2004

2. *Continue with the current percentage of slag in the production of PSC*

   Continuation with current practice of slag mix in PSC is possible for cases where company has succeeded in creating a niche for itself with at least some clients.

3. *Reduction in slag content in PSC*

   This scenario is also likely as Ordinary Portland cement is still the most sought after cement in India and would continue to be so considering the poor acceptability of blended cements. Scenario of reducing slag content in PSC is highly probable scenario as witnessed during year 2003-04. Due to poor market acceptance IRCL had to reduce slag content in PSC. The project activity of increasing slag content is not possible without more promotional and R&D efforts, which would require additional investments from IRCL.

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

In India, Bureau of Indian Standards (BIS) defines the norms for cement production and its applications. Portland Slag Cement has to comply with IS: 455, 1989, which stipulates that the Slag content shall not be less than 25% and not more than 70% of PSC produced. It is statutory requirement that each cement brand must conform to BIS specification. All the project alternatives follow BIS regulations.

So, all the alternatives as mentioned in Step 1(a) qualify the Step 1(b).

Step 2: Barrier Analysis

Sub-step 2a: Identify barriers that would prevent the implementation of type of the proposed project activity

IRCL was the first one (and till today the only plant) to produce and market PSC in western region .IRCL had to take the responsibility of making PSC saleable in the region on its own. IRCL had invested heavily in R&D and marketing efforts to promote PSC in the region. Many cement producers have tried to enter this market, however due to various barriers they were not able to succeed in PSC sales in the region.

Within 2 years of operations IRCL has created a niche position in the market in PSC sales. Between 2 options of continuing with the current slag content in PSC and increasing slag content in PSC, second option was difficult to pursue as it would have entailed additional R&D efforts to develop cement product and additional marketing efforts. In the year 2002 however, the company board decided to increase the slag content in the cement to continue with the operations considering the CDM benefits from the activity and use those benefits in PSC marketing & technical efforts.[5]. It is expected that CDM revenue would help in removing the barriers for the project activity.

Technological barriers

The cements in India are graded by BIS, Bureau of Indian Standards and there are a number of grades available for OPC such as OPC 33, OPC 43 and OPC 53. The market uses these cement grades according to the application's requirement and standards are well in place on their use in various applications. These are the benchmark in the construction industry and references for cement use are defined on the basis of these grades in tender notes.

As Indian market is predominantly OPC/PPC based not much R&D efforts have been done in PSC. And to expand the PSC market in the region it is necessary to develop higher strength PSC suitable for various applications. It is also important to develop technical papers/knowledge for creating awareness about benefits of higher slag content PSC. Higher investments required in R&D for PSC as against any other cement is a major barrier for such kind of project activity.

The project proponent has created an in-house cell of technical experts to develop PSC with higher slag content. The technical cell also provides solutions to specific problems faced by consumers. IRCL has also availed the services of known national & international consultants to develop PSC use in various applications.

Market barriers:

- There is always this perception in the market that the blended cements are of inferior quality as these contain "waste" and so can't be good enough. This needs extra efforts on the part of the producer to change this market misinformation.
- In India major infrastructural investment is done by Government agencies and the purchase pattern from the govt/ public enterprises, which categorically state for the use of only OPC grades in its construction activities also add to this perception.
    - IRCL was one of the first companies to promote PSC in Government sectors. IRCL had made many presentations to the Government officials to enhance PSC awareness,
    - IRCL has conducted comprehensive testing of PSC to validate the strength and other characteristics required for various applications. IRCL has also got technical consultancy from independent institutions like IIT Mumbai.
    - IRCL has taken approvals from various government departments for use of PSC (Brihann Mumbai Municipal Corporation- BMC, Central Road Research Institute-CRRI etc.

[5] Documentary evidence shall be provided to DOE for validation

- The producers of blended cements have to invest substantially on R&D of such cements and also to correct the market perception by various marketing & technical initiatives, which lead to increased costs of such cements, further adding to low penetration of slag-blended cements.

The technological & market barriers prevent the use of increased blends in PSC and it needs dedicated efforts by the manufacturers for removing these barriers through efforts in market promotions and R&D. Hence the project activity is additional and not the baseline scenario.

Step 3: Common Practice

The project activity is based in the state of Maharashtra, which is the fifth largest cement producer state in India[6]. However the project activity is the only one of its kind in the state (and also in entire Western region) and no other cement producers are producing PSC. In the western region as defined by CMA more than 99.9% of PSC in year 2001-02 was produced by IRCL (In year 2004-05 this figure is 98.9%). This is an indication that the project activity is not common practice and is additional.

Step 4: Impact of CDM registration

The registration of the project as CDM project activity shall result in the following –

- The project proponent shall use the CDM benefits to further their efforts on R&D of such cements and the buyers shall have a choice to select between OPC grades and equivalent/ superior PSC grades.
- The project proponent shall use the CDM benefits to create awareness in the market place about the use of PSC cements by conducting seminars, workshops, training seminars for contractors, builders and mesons etc.
- The project activity shall encourage more industries in the state/ on the national level to produce PSC, which in turn shall also solve the problem to some extent related with the disposal of slag from the blast furnaces of steel industries.

If carbon credits from registering project activity as CDM activity are not availed to remove market barriers restricting increased slag content in blended cement, project activity shall stabilize slag content level as acceptable by the market. The project activity is additional and is not the business-as-usual scenario for the project proponent.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:

The project boundary includes the cement production plant, onsite power generation, and the power generation in the grid (if applicable).

Following emission sources are accounted for in the project activity:

- Direct emissions at the cement plant due to fuel combustion for:
  - Firing the kiln (including supplemental fuels used in the pre-calciner);
  - Processing (including drying) of solid fuels, raw materials, and additives;

[6] CMA : Cement Statistics 2004

- Direct emissions due to calcination of limestone (i.e. calcium carbonate and magnesium carbonate, present in the raw meal).
- Indirect emissions from fossil fuel combustion in power plants in the grid due to electricity use at the cement plant

The power grid or plant from which the cement plant purchases electricity and its losses will be considered in determining indirect emissions. Any transport related emissions for the delivery of additional additives will be included in the emissions related to the project activity as leakage. Emissions reductions from transport of raw materials for clinker production are not taken into account as a conservative simplification.

Gases included: CO2 only. Changes in CH4 and N2O emissions from combustion processes are considered to be negligible and excluded because the differences in the baseline and project activity are not substantial. This assumption simplifies the methodology and is conservative.

B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:

10/10/2005

Emergent Ventures India Pvt Ltd (Also a project participant)
II C-141 Ridgewood Estate, DLF Phase IV
Gurgaon, Haryana – 122 002, India
Phone: 91-124 5102980
Mobile: 91-9312547154
Email: ashutosh@emergent-ventures.com

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:

1st April 2002.

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

30 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:

1st April 2002

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

C.2.2.2. Length:

SECTION D. Application of a monitoring methodology and plan

D.1. Name and reference of approved monitoring methodology applied to the project activity:

The project activity uses the monitoring methodology ACM0005 "Consolidated Monitoring Methodology for the Production of Blended Cement"

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

The project activity complies with the applicability criteria for the monitoring methodology ACM0005 in the following manner[7] -

1) This project activity is using increased level of slag in production of PSC beyond the level of regional practice.
2) There is no shortage of slag being used as additive in PSC, which is generated in blast furnaces of the neighbouring steel industry and is a waste with problems associated with its handling & disposal.
3) The PSC production considered for the calculation of CERs is the net PSC sold out in the domestic markets only.
4) Data on cement industry has been taken from Cement Manufacturers' Association annual reports.

[7] See Section B.1.1 for applicability criteria

D.2. 1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:								
ID number *(Please use numbers to ease cross-referencing to D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1	$InCaO_y$	Plant records	%	C	Daily	100%	Electronic	% for raw material used by the sourcing plants would be considered
2	$OutCaO_y$	Plant records	%	M,C	Daily	100%	Electronic	Calculated as part of normal operations. % for clinker for all the sourcing plants would be measured.
3.	$InMgO_y$	Plant records	%	C	Daily	100%	Electronic	% for raw material used by the sourcing plants would be considered
4.	$OutMgO_y$	Plant records	%	M,C	Daily	100%	Electronic	Calculated as part of normal operations. % for clinker for all the sourcing plants would be measured.
5.	Quantity of clinker raw material	Plant records	KT	E	Annually	100%	Electronic	Taken from the sourcing plants
6.	$CLNK_y$	Plant records	Kilo tonnes of clinker	M	Annually	100%	Electronic	Purchase Orders details clinker quantity from various sourcing plants
7.	ADD_y Quantity of additives	Plant records	Kilo tonnes	M	Monthly	100%	Electronic	
8.	BC_y Quantity of Blended Cement	Plant records	Kilo tonnes	M	Monthly	100%	Electronic	
9.	tE_y	National Weighted Average	kcal/ kg of clinker	E	Annually	100%	Electronic	CMA Data

10.	EFE_i	IPCC default value	tCO2/GJ of fuel i	E	Annually	100%	Electronic	Fuel considered is Coal
11.	eE_y	National Weighted Average	kWh/kg of clinker	E	Annually	100%	Electronic	CMA Data
12.	EF_{grid_y}	See comment	tCO2/MWh	C	Annually	100%	Electronic	ACM002 used to determine electricity emissions factor for grid, see Annex 3 for details
13.	$PELE_{grid\_CLNK,y}$	Plant records	MWh	M	monthly	100%	Electronic	
14.	$PELE_{grid\_ADD\_y}$	Plant record	MWh	M	Monthly	100%	Electronic	
15.	$PELE_{grid\_BC,y}$	Plant records	MWh	M	Monthly	100%	Electronic	
16.	$PE_{calcin,y}$	Plant records	tCO2/ tonne clinker	C	Annually	100%	Electronic	
17.	$PE_{fossil\_fuel,y}$	Plant records	tCO2/tonne clinker	C	Annually	100%	Electronic	
18.	$PE_{ele\_grid\_CLNK,y}$	Plant records	tCO2/tonne clinker	C	Annually	100%	Electronic	
19.	$PE_{ele\_grid\_ADD,y}$	Plant records	tCO2/tonne cement	C	Annually	100%	Electronic	
20.	$PE_{ele\_grid\_Blend,y}$	Plant Records	tCO2/tonne of blended cement	C	Annually	100%	Electronic	
21.	$P_{Blend,y}$	Plant recods	Tonne of clinker/ tonne of blended cement	C	Annually	100%	Electronic	

D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

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$PE_{BC,y} = [PE_{clinker,y} * P_{Blend,y}] + PE_{ele\_ADD\_BC,y}$ **(1)**

where:

$PE_{BC,y}$ = CO_2 emissions per tonne of Blended cement, BC in the project activity plant in year y(t CO_2/tonne BC)
$PE_{clinker,y}$ = CO_2 emissions per tonne of clinker in the project activity plant in year y (t CO_2/tonne clinker) and defined below
$P_{Blend,y}$ = Share of clinker per tonne of BC in year y (tonne of clinker/tonne of BC)
$PE_{ele\_AD,D\_BC,y}$ = Electricity emissions for clinker and additives grinding and blending of blended cement in year y (tCO2/tonne of BC)

CO_2 per tonne of clinker in the project activity plant in year y is calculated as below:

$PE_{clinker,y} = PE_{calcin,y} + PE_{fossil\_fuel,y} + PE_{ele\_grid\_CLNK,y}$ **(1.1)**

where:

$PE_{clinker,y}$ = Emissions of CO_2 per tonne of clinker in the project activity plant in year y (t CO_2/tonne clinker)
$PE_{calcin,y}$ = Emissions per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate in year y (t CO_2/tonne clinker)
$PE_{fossil\_fuel,y}$ = Emissions per tonne of clinker due to combustion of fossil fuels for clinker production in year y (t CO_2/tonne clinker)
$PE_{ele\_grid\_CLNK,y}$ = Electricity emissions for clinker production per tonne of clinker in year y (t CO_2/tonne clinker)

$PE_{calcin,y} = 0.785*(OutCaO_y - InCaO_y) + 1.092*(OutMgO_y - InMgO_y) / [CLNK_y * 1000]$ **(1.1.1)**

$PE_{calcin,y}$ = 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)
$CLNK_y$ = Annual use of clinker in year y (tonnes of clinker)

$PE_{fossil\_fuel,\ y} = [tE_{,y} * K* EFF_i]/1000*1000$ **(1.1.2)**

where:

$PE_{fossil\_fuel,y}$ = Emissions per tonne of clinker due to combustion of fossil fuels for clinker production in year y (t CO_2/tonne clinker)
$tE_{,y}$ = Sp. thermal energy consumption for clinker production in year y (kcal /kg of clinker)
K= Energy Conversion Factor = 4.187 kJ/kcal

EFF_i = Emission factor for fossil fuel i (kg CO2/GJ)

$PE_{ele\_grid\_CLNK,y} = [(eE_{i\_y} * EF_{grid\_y})]$	**(1.1.3)**

where:
$PE_{ele\_grid\_CLNK,y}$ = Electricity emissions for clinker production per tonne of clinker in year y (t CO_2/tonne clinker)
eE_{i_y} = Sp. electrical energy consumption for clinker production in year y (kWh/ kg of clinker)
EF_{grid_y} = Grid emission factor in year y(t CO_2/MWh)

$PE_{ele\_ADD\_BC,y} = PE_{ele\_grid\_CLNK,y} * P_{Blend,y} + PE_{ele\_grid\_ADD,y} * (1- P_{Blend,y}) + PE_{ele\_grid\_BC,y}$	**(1.2)**

where:
$PE_{ele\_AD,D\_BC,y}$ = Electricity emissions for BC and additives grinding and blending of blended cement in year y (tCO2/tonne of BC)
$PE_{ele\_grid\_CLNK}$ = Electricity emissions for BC grinding in year y (tCO2/tonne of clinker)
$PE_{ele\_grid\_ADD}$ = Electricity emissions for additive grinding in year y (tCO2/tonne of additives)
$PE_{ele\_grid\_BC}$ = Electricity emissions for blending of cement in year y (tCO2/tonne of BC)
P_{Blend} = Clinker-BC ratio in year y (tonne of clinker/ tonne of BC)

$PE_{ele\_grid\_CLNK,y} = [PELE_{grid\_CLNK,y} * EF_{grid,y}] /[CLNK_y * 1000]$	**(1.2.1)**

where
$PE_{ele\_grid\_CLNK}$ = Electricity emissions for clinker grinding in year y (tCO2/tonne of clinker)
$PELE_{grid\_CLNK,y}$ = Grid electricity for grinding clinker (MWh)
EF_{grid_y} = Grid emission factor in year y (t CO_2/MWh)
$CLNK_y$ = Annual use of clinker in year y (kilotonnes of clinker)

$PE_{ele\_grid\_ADD} = [(PELE_{grid\_ADD} * EF_{grid\_y})] /[ADD_y * 1000]$	**(1.2.2)**

where
$PE_{ele\_grid\_ADD}$ = Electricity emissions for additive grinding in year y (tCO2/tonne of additives)
$PELE_{grid\_ADD}$ = Grid electricity for grinding additives (MWh)
EF_{grid_y} = Grid emission factor in year y (t CO_2/MWh)
ADD_y = Annual consumption of additives in year y (kilotonnes of additives)

$PE_{ele\_grid\_Blend,y} = [(PELE_{grid\_BC} * EF_{grid\_y})] /[BC_y * 1000]$	**(1.2.3)**

where
$PE_{ele\_grid\_Blend,y}$ = Electricity emissions for blending of cement in year y (tCO2/tonne of BC)

$PELE_{grid\_BC,y}$ = Grid electricity for grinding BC (MWh)
EF_{grid_y} = Grid emission factor in year y (t CO_2/MWh)
BC_y = Annual production of BC in year y (kilotonnes of BC)

All fuel uses are expressed in net calorific values (NCV) or lower heating value (LHV). All units use the metric system, unless specified otherwise. In determining emission coefficients, emission factors or net calorific values in this methodology, guidance by the 2000 IPCC Good Practice Guidance should be followed where appropriate.

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :								
ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1	$InCaO_{BSL}$	Plant records	%	C	Daily	100%	Electronic	Calculated as part of normal operations
2	$OutCaO_{BSL}$	Plant records	%	M,C	Daily	100%	Electronic	Calculated/measured as part of normal operations
3.	$InMgO_{BSL}$	Plant records	%	MC	Daily	100%	Electronic	Calculated/measured as part of normal operations
4.	$OutMgO_{BSL}$	Plant records	%	M,C	Daily	100%	Electronic	Calculated/measured as part of normal operations
5.	Quantity of clinker raw material	Plant records	KT	M	Annually	100%	Electronic	
6.	$CLNK_{BSL}$	Plant records	Kilo tonnes of clinker	M	Annually	100%	Electronic	
7.	ADD_{BSL} Quantity of additives	Plant records	Kilo tonnes	M	Monthly	100%	Electronic	

8.	BC_{BSL} Quantity of Blended Cement	Plant records	Kilo tonnes	M	Monthly	100%	Electronic	
9.	tE_{BSL}	National Weighted Average	kcal/ kg of clinker	E	Annually	100%	Electronic	
10.	EFE_i	IPCC default value	tCO2/GJ of fuel i	E	Annually	100%	Electronic	Fuel considered is Coal
11.	eE_{BSL}	National Weighted Average	kWh/kg of clinker	E	Annually	100%	Electronic	
12.	EF_{grid_BSL}	See comment	tCO2/MWh	C	Annually	100%	Electronic	ACM002 used to determine electricity emissions factor for grid, see Annex 3 for details
13.	$BELE_{grid\_CLNK,}$	Plant records	MWh	M	monthly	100%	Electronic	
14.	$BELE_{grid\_ADD}$	Plant record	MWh	M	Monthly	100%	Electronic	
15.	$BELE_{grid\_BC}$	Plant records	MWh	M	Monthly	100%	Electronic	
16.	BE_{calcin}	Plant records	tCO2/ tonne clinker	C	Annually	100%	Electronic	
17.	BE_{fossil_fuel}	Plant records	tCO2/tonne clinker	C	Annually	100%	Electronic	
18.	$BE_{ele\_grid\_CLNK}$	Plant records	tCO2/tonne clinker	C	Annually	100%	Electronic	
19.	$BE_{ele\_grid\_ADD}$	Plant records	tCO2/tonne cement	C	Annually	100%	Electronic	
20.	$BE_{ele\_grid\_Blend}$	Plant Records	tCO2/tonne of blended cement	C	Annually	100%	Electronic	

21.	$B_{Blend,y}$	Plant recods	Tonne of clinker/ tonne of blended cement	C	Annually	100%	Electronic	

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

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$$BE_{BC,y} = [BE_{clinker} * B_{Blend,y}] + BE_{ele\_ADD\_BC} \quad (2)$$

where:

$BE_{BC,y}$ = Baseline CO_2 emissions per tonne of blended cement type (BC) (tCO_2/tonne BC)
$BE_{clinker}$ = CO_2 emissions per tonne of clinker in the baseline in the project activity plant (t CO_2/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 clinker grinding and preparation of additives (tCO2/tonne of BC)

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

$$BE_{clinker} = BE_{calcin} + BE_{fossil\_fuel} + BE_{ele\_grid\_CLNK} \quad (2.1)$$

where:

$BE_{clinker}$ = Baseline emissions of CO_2 per tonne of clinker in the project activity plant (t CO_2/tonne clinker)
BE_{calcin} = Baseline emissions per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate (t CO_2/tonne clinker)
BE_{fossil_fuel} = Baseline emissions per tonne of clinker due to combustion of fossil fuels for clinker production (t CO_2/tonne clinker)
$BE_{ele\_grid\_CLNK}$ = Baseline electricity emissions for clinker production per tonne of clinker (t CO_2/tonne clinker)

$$BE_{calcin} = [0.785*(OutCaO - InCaO) + 1.092*(OutMgO - InMgO)] / [CLNK_{BSL} * 1000] \quad (2.1.1)$$

BE_{calcin} = 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 = CaO content (%) of the raw material * raw material quantity (tonnes)
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 use of clinker in the base year (kilotonnes of clinker)

$BE_{fossil\_fuel} = [tE_{,y} * K * EFF_i]/1000*1000$	**(2.1.2)**

BE_{fossil_fuel} = Baseline emissions per tonne of clinker due to combustion of fossil fuels for clinker production in base year (t CO_2/tonne clinker)
$tE_{,y}$ = Sp. thermal energy consumption for clinker production in base year (kcal /kg of clinker)
K= Energy Conversion Factor = 4.187 kJ/kcal
EFF_i = Emission factor for fossil fuel i (kg CO2/GJ)

$BE_{ele\_grid\_CLNK} = [(eE_{i\_y} * EF_{grid})]$	**(2.1.3)**

where:
$BE_{ele\_grid\_CLNK}$ = Electricity emissions for clinker production per tonne of clinker in base year (t CO_2/tonne clinker)
eE_{i_y} = Sp. electrical energy consumption for clinker production in base year (kWh/ kg of clinker)
EF_{grid} = Grid emission factor (t CO_2/MWh)

$BE_{ele\_ADD\_BC} = BE_{ele\_grid\_CLNK} * B_{Blend} + BE_{ele\_grid\_ADD} * (1- B_{Blend}) + BE_{ele\_grid\_BC,}$	**(2.2)**

where:
BE_{ele_AD,D_BC} = Electricity emissions for BC and additives grinding and blending of blended cement in base year (tCO2/tonne of BC)
$BE_{ele\_grid\_CLNK}$ = Electricity emissions for BC grinding in base year (tCO2/tonne of clinker)
$BE_{ele\_grid\_ADD}$ = Electricity emissions for additive grinding in base year (tCO2/tonne of additives)
$BE_{ele\_grid\_BC}$ = Electricity emissions for blending of cement in base year (tCO2/tonne of BC)
B_{Blend} = Baseline clinker-BC ratio (tonne of clinker/ tonne of BC)

$BE_{ele\_grid\_CLNK} = [BELE_{grid\_CLNK} * EF_{grid}] /[CLNK_{BSL} * 1000]$	**(2.2.1)**

where
$BE_{ele\_grid\_CLNK}$ = Electricity emissions for clinker grinding in base year (tCO2/tonne of clinker)
$BELE_{grid\_CLNK}$ = Grid electricity for grinding clinker in base year (MWh)
EF_{grid}= Baseline grid emission factor (t CO_2/MWh)
$CLNK_{BSL}$ = Annual use of clinker in base year (kilotonnes of clinker)

$BE_{ele\_grid\_ADD} = [(BELE_{grid\_ADD} * EF_{grid})] /[ADD_{BSL} * 1000]$	**(2.2.2)**

where
$BE_{ele\_grid\_ADD}$ = Baseline electricity emissions for additive grinding (tCO2/tonne of additives)
$BELE_{grid\_ADD}$ = Grid electricity for grinding additives in base year (MWh)
EF_{grid} = Grid emission factor (t CO_2/MWh)

ADD_{BSL} = Annual consumption of additives in the base year (kilotonnes of additives)

$BE_{ele\_grid\_Blend,y}$ = [($BELE_{grid\_BC}$ * EF_{grid})] /[BC_{BSL}* 1000]	**(2.2.3)**

where
$BE_{ele\_grid\_Blend}$ = Baseline electricity emissions for blending of cement (tCO2/tonne of BC)
$BELE_{grid\_BC}$ = baseline grid electricity for grinding BC (MWh)
EF_{grid} = Grid emission factor in (t CO_2/MWh)
BC_{BSl} = Annual production of BC in base year (kilotonnes of BC)

D. 2.2. Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).

D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):
>>

D.2.3. Treatment of leakage in the monitoring plan

D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1.	TF_{cons}	Plant records	Kg of fuel/kiolometer	C	Annually	100%	Electronic	
2.	D_{add_source}	Plant records	km	M	Per trip	100%	Electronic	
3.	TEF	IPCC	Kg CO2/ kg of fuel	E	Annually	100%	Electronic	
4.	Q_{add}	Plant records	Tonnes of additives/ vehicle	M	Per trip	100%	Electronic	
5.	$ELE_{conveyor\_ADD}$	Plant records	MWh	M	Monthly	100%	Electronic	
6.	EF_{grid}	National grid/plant data (if onsite generation)	Tonnes of CO2/MWh	C	Annually	100%	Electronic	
7.	α_y	Plant records	Tonnes of additive	M/C	Annually	100%	Electronic	

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

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$L_{add\_trans} = [(TF_{cons} * D_{add\_source} * TEF) + (ELE_{conveyor\_ADD} * EF_{grid})] * 1/Q_{add} * 1/1000$	**(3)**

where:
L_{add_trans} = Transport related emissions per tonne of additives (t CO_2/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 CO_2/kg of fuel)
$ELE_{conveyor\_ADD}$ = Electricity consumption for conveyor system for additives (MWh)
EF_{grid} = Grid electricity emission factor (tonnes of CO_2/MWh)
Q_{add} = Quantity of additive carried in one trip per vehicle (tonnes of additive)
And leakage emissions per tonne of BC due to additional additives are determined by

$L_y = L_{add\_trans} * [B_{blend,y} – P_{blend,y}] * BC_y$	**(3.1)**

where:
L_y = Leakage emissions for transport of additives (kilotonnes of CO_2)
BC_y = Production of BC in year y (kilotonnes 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 tonnes of additives are surplus, the project emissions reductions are reduced by the factor á, which is defined as:

α_y = x tonnes of additives in year y / total additional additives used in year y	**(4)**

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>>

$ER_y = \{ [BE_{BC,y} – PE_{BC,y}] * BC_y + L_y \} * (1 – \alpha_y)$	**(5)**

where:
ER_y = Emissions reductions in year y due to project activity (thousand tonnes of CO_2)
$BE_{BC,y}$ = Baseline emissions per tonne of BC (t CO_2/tonnes of BC)
$PE_{BC,y}$ = Project emissions per tonne of BC in year y (t CO_2/tonnes of BC)
BC_y = BC production in year y (thousand tonnes)

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored		
Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
Table D.2.1.1 (ID numbers from 1-21)	Low-medium	The data will be collected as part of normal plant level operations. QA/QC requirements consist of cross-checking these with other internal company report. Local data and where applicable IPCC data will be used. Independent agency verification will also be used.
Table D.2.1.3 (ID numbers from 1-21)	Low-medium	The data will be collected as part of normal plant level operations. QA/QC requirements consist of cross-checking these with other internal company report. Local data and where applicable IPCC data will be used. Independent agency verification will also be used.
Table D.2.3 ID numbers 1-7	Low	

D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

A CDM champion team will be constituted with participation from Production, Purchase & Stores, Quality, Sales & Marketing, R&D and finance.

This team will first be trained about CDM concepts and then they will be given the responsibility of collecting & maintaining data. This team will meet periodically (Proposed period of 3 months) to review CDM project activity and also to check data collected to estimate emissions reduction.

One person dedicated to CDM related activity will be appointed. This person would be responsible for gathering data from all relevant functions, and to keep records of the same. This person will report to CDM team.

IRCL is an ISO certified company, and maintains all production/purchase/sales records as per audit guidelines.

D.5 Name of person/entity determining the monitoring methodology:

>>
Emergent Ventures India Pvt. Ltd (Also a project participant)
II C-141 Ridgewood Estate, DLF Phase IV
Gurgaon, Haryana – 122 002, India

Phone: 91-124 5102980
Mobile: 91-9312547154
Email: ashutosh@emergent-ventures.com

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

IRCL procures clinker from a number of clinker producing plants in Gujarat & Karnataka states. Project emissions for the clinker use is estimated based on following assumptions –

Parameter	Data Required	Assumption/ remarks
Emissions of CO2 per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate in the year y	%CaO, %MgO	Lab test reports of clinker and the weighted mass average of CaO & MgO is taken.
Emissions per tonne of clinker due to combustion of fossil fuels for clinker production in the year y	Specific thermal energy consumption;	National Best Figures for 2002-03 is taken (This is conservative). Data sourced from *CMA's : Energy performance Achievements in Indian cement Industry.*
Emissions per tonne of clinker due to electrical energy consumption for clinker production in the year y	Electrical energy consumption in clinker production	National Best Figures for 2002-03 is taken (This is conservative). Data sourced from *CMA's : Energy performance Achievements in Indian cement Industry*
Emissions per tonne of cement due to electrical energy consumption for additive preparation & blending in the year y	Electrical energy consumption in blending & additive preparation	Actual Plant Data is used

		year 1	year 2	year 3	year 4	year 5	year 6	year 7
Emissions in the Project Activity Sources	UoM	**2002-03**	**2003-04**	**2004-05**	**2005-06**	**2006-07**	**2007-08**	**2008-09**
	tCO2/y	217659.6	246765.5	231579.1	192264.3	192264.3	192264.3	192264.3

E.2. Estimated leakage:

IRCL and its slag sourcing steel plant are in one complex and thus it does not require vehicular transportation for slag to reach its facility. Slag is carried through conveyors from the steel plant to the IRCL facility.

		year 1	year 2	year 3	year 4	year 5	year 6	year 7
Leakage from the Project Activity	UoM	**2002-03**	**2003-04**	**2004-05**	**2005-06**	**2006-07**	**2007-08**	**2008-09**
	tCO2/y	5.6	4.0	11.7	25.6	23.9	22.1	20.3

E.3. The sum of E.1 and E.2 representing the project activity emissions:

		year 1	year 2	year 3	year 4	year 5	year 6	year 7
Total Emissions due to Project Activity	UoM	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
	tCO2/y	217665.2	246769.5	231590.8	192289.9	192288.2	192286.4	192284.6

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

		year 1	year 2	year 3	year 4	year 5	year 6	year 7
Emissions in the Baseline	UoM	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
	tCO2/y	243804.7	257646.3	261802.8	257380.1	252868.9	248267.4	243574.0

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

Year	UoM	Emissions in the Baseline	Total Emissions due to Project Activity	Net Emissions Reduction from Project Activity
2002-03	tCO2/y	243804.7	217665.2	**26139.5**
2003-04	tCO2/y	257646.3	246769.5	**10876.7**
2004-05	tCO2/y	261802.8	231590.8	**30212.0**
2005-06	tCO2/y	257380.1	192289.9	**65090.2**
2006-07	tCO2/y	252868.9	192288.2	**60580.7**
2007-08	tCO2/y	248267.4	192286.4	**55981.0**
2008-09	tCO2/y	243574.0	192284.6	**51289.3**

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

Year	UoM	Emissions in the Baseline	Emissions due to Project Activity sources	Leakages	Net Emissions Reduction from Project Activity
2002-03	tCO2/y	243804.7	217659.6	5.6	26139.5
2003-04	tCO2/y	257646.3	246765.5	4.0	10876.7
2004-05	tCO2/y	261802.8	231579.1	11.7	30212.0
2005-06	tCO2/y	257380.1	192264.3	25.6	65090.2
2006-07	tCO2/y	252868.9	192264.3	23.9	60580.7
2007-08	tCO2/y	248267.4	192264.3	22.1	55981.0
2008-09	tCO2/y	243574.0	192264.3	20.3	51289.3

SECTION F. Environmental impacts

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

As per BIS slag content in Portland Slag Cement can be between 25% - 70% and doesn't need any Environment Impact study for the PSC complying with the standards.

F.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:

The project activity does not carry any negative impact on environment. It has certain positive impacts though on the environment -

- Conservation of valuable natural resources of raw material used in cement production i.e. limestone, coal etc.
- Energy conservation as less quantity of clinker is used in PSC production
- Solving the problem of slag disposal from the steel industries
- GHG emissions reduction associated with cement production

SECTION G. Stakeholders' comments

The project activity helps in the sustainable development of the region by–

- Reducing the problems associated with handling, storage and disposal of the slag generated in the nearby steel plants. (In normal practice slag is dumped in wasteland.)
- Decreasing wasteland sites used for slag disposal.
- Reduced energy requirement leads to enhanced energy security in the region supported by reduced losses in transmission & distribution of electrical power

- Low clinker requirement shall help in conservation of the natural resources e.g. limestone & coal

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

IRCL have taken Stakeholder's views in managing the project activity continually. Following are the main stakeholders for this project activity:

- **Customers/Users:** IRCL regularly meet its customers and take their comments/feedback. These suggestions are very helpful in developing products that suit market needs.

- **Government of India (GoI):** IRCL meets all requirements as decided by BIS for use of slag content in blended cement. IRCL actively participate in all forums and proactively develops ideas for promotion of increasing use of slag.

- **Industry/technical Experts:** IRCL have always taken expert's feedback and opinions while developing cement products. They have taken services of external experts who help their internal technical cell in developing PSC for different applications. In the past they have also taken services international experts for conducting seminars on PSC.

- **Steel Plants:** IRCL has entered into an agreement with neighbouring steel plant to utilise slag generated in the process. Slag is a waste product for steel plants with not much commercial use, also there are problems related to disposal of slag. Because of these reasons steel plant has shown encouragement towards slag use in blended cement by signing an agreement with IRCL.

- **Cement Manufacturers Association (CMA):** CMA is also an important stakeholder in this project. CMA as an association helps in introducing newer ideas in Indian cement industry. Discussions with CMA officials were held to understand the industry approach in increasing slag content in cement and possible issues with the same.

IRCL has arranged a meeting with people from local community to discuss about the project activity. The meeting started with the welcome note and thereafter they were briefed IRCL and the project activity.

Then the following issues were discussed:

Q1: Should slag usage be encouraged in the cement? Would they personally support such projects? Do they have any comments/suggestions?

A1: It was replied that it is certainly a beneficial project and needs to be given wider publicity and no doubt the community supports such environment friendly project. It was suggested that Government should also promote use of PSC and setting up of PSC plants and extend necessary help for such projects.

Q2: What do you think about PSC vis-à-vis OPC/PPC?

A2: IRCL team has explained the characteristics of OPC/PPC/PSC. Based on this discussion and from participant's own experiences of using different cement types it was commented that; PSC is certainly a better product vis-à-vis OPC/PPC.

Q3: What do you think that other than environmental and construction benefits, does it also has socioeconomic benefits.

A3: Yes, since it generates employment for local people which, ultimately help in uplift of socioeconomic standard the people and the region as a whole.

Q4: How do they find interactions with the project staff?

A4: It was really an informative & interesting interactive and an eye opening session.

Q5: Any suggestions?

A5: If possible for the company, they must hold more such meetings for public awareness.

G.2. Summary of the comments received:

There is no negative impact from any of the stakeholders' representatives for the project activity. More over the project activity has helped in the sustainable development of the region by solving to some extent the problem of slag disposal for the neighbouring steel plant, conserving the invaluable natural resources and increasing energy security of the region.

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

There was no negative comment on the project activity from the stakeholders.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No Public Funding Obtained.

Annex 3

BASELINE INFORMATION

Grid Emission Factor for MSEB-

Approach suggested in Approved Consolidated Methodology **ACM0002** is used to estimate grid emission factor.

STEP 1: Grid Selection

IRCL is in the state of Maharashtra, India. Grid emission factor is calculated using data about plants supplying power to Maharashtra State Electricity grid. These include the state & private owned power generation units. Maharashtra has a share in power generation from centrally owned plants also. **Data about all these plants have been considered while calculating grid emission factor**. Western Region Electricity Board (WREB) annual reports and Central Electricity Authority (CEA) data are used for this purpose.

Power Generation in Maharashtra from various Generating Units 2004-05

Hydro
State Sector
Koyna I & II
Koyna III
Koyna IV
Koyna-DPH
Vaitarna
Tillari
Bhira TR
Vir & Bhatghar
Paithan
Pawana
Panshet
Varasgaon
Eldari
Bhandardara
Radhanagari
Bhatsa
Dhom
Kanhar
Ujjani
Manikdoh
Warna
Pench - share (33%)
Dimbhe
Surya
Dudhganga
Yeoteshwar
Terwanmedhe
Sardar sarovar (27%)
Private Sector
Khopoli
Bhivpuri
Bhira
Bhira PSU

Power Generation in Maharashtra from various Generating Units 2004-05
Gas
State Sector
Uran
Uran WHR
Private sector
Trombay
Dhabol
Central sector
Kawas CGPP
Gandhar CGPP

Power Generation in Maharashtra from various Generating Units 2004-05
Thermal
State Sector
Nasik
Koradi
Bhusawal
Parli
Khaparkheda
Chandrapur
Paras
Private sector
Dahanu BSES
Trombay TPC
Central sector
KSTPS
VSTPS

Power Generation in Maharashtra from various Generating Units 2004-05
Nuclear
Central sector
Tarapur NPP
Kakrapar NPP

STEP 2: Calculation of the Operating Margin emission factor (GEF_{OM})

Among the four options described in the ACM0002, the method of **Simple OM** is adopted for the project activity as –

1. Data for Dispatch Data Analysis is not available, and

2. Low cost/ must run power sources contribute less than 50% of the total grid generation in the state in average of the five most recent years. State grid is thermal power dominated; about 90% power is supplied using thermal energy sources. Only 10% is provided by hydro and other sources.

Power Generation Mix* in Maharashtra for recent 5 years

	2000-01	2001-02	2002-03	2003-04	2004-05
Thermal (Coal + Gas)	64278.42	64777.92	NA	66440.52	68463.81
Low cost/ must run (Hydro+nuclear)	7449.28	7615.72	NA	7464.93	7452.24
Total Power for the State	71727.7	72393.64	NA	73905.45	75916.05
% low cost/ must run	**10%**	**11%**	**NA**	**10%**	**10%**

in Million Units

* Includes both state generated and central's allocation to the state

Simple OM- The Simple OM emission factor ($GEF_{OM,simple}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants.

The emission factor for each plant in a year is estimated as follows –

1. Data on Gross power generation and auxiliary power consumption is used to estimate net power generation for all the plants contributing towards state power requirement.
2. Design Heat rate (more conservative) is taken for all the contributing plants and the fuel type is considered while estimating the emissions for per unit of power generation from the individual plants. In cases where plant heat rate is not available region level heat rates are used.
3. Emission factor for each fuel type is used as per the Revised IPCC guidelines.
4. Weighted average of emission factors of all the plants excluding the low cost/ must run source of power is estimated, which is the OM for the state grid for a year.

The vintage of data for estimating Simple OM taken is 3-year average based on the most recent statistics available. (OM for the year 2001-02, 2003-04 & 2004-05 has been considered)

Operating Margin for Maharashtra 2004-05

OM 2001-02	0.897
OM 2003-04	0.897
OM 2004-05	0.899
Average OM	**0.898**

STEP 3: Calculation of the Build Margin emission factor (GEF_{BM})

Calculation of the Build Margin emission factor GEF_{BM}, *is* based on the most recent information available on plants already built for the sample group. The sample group consists of "**The power plants capacity additions in the electricity system that comprises 20% of the system generation (in MWh) and that have been built most recently**".

STEP 4: Calculate the Grid Emission Factor (*GEF*)

Grid Emission factor is the weighted average of the Operating Margin emission factor (GEF_{OM}) and the Build Margin emission factor (GEF_{BM}):

$GEF = wOM \text{ X } GEF_{OM} + wBM \text{ X } GEF_{BM}$

Where the weights *wOM* and *wBM*, by default, are 50% (i.e., $wOM = wBM = 0.5$), and GEF_{OM} and GEF_{BM} are calculated as described in Steps 1 and 2 above and are expressed in tCO2/MWh. The weighted averages applied by the project participant are fixed for the entire crediting period.

Combined Margin for Maharashtra 2004-05	
OM 2001-02	0.897
OM 2003-04	0.897
OM 2004-05	0.899
Average OM	**0.898**
BM 2004-05	**0.683**
Combined Margin 2004-05	**0.790**

Energy resources in MH from various Generating Units 2004-05

Order	Installed Cap.	Effective Cap.	Gross Generation	Auxiliary Consumption	Net Generation	EF
	MW	MW	MU	MU	MU	tCO2/MWh
Hydro					**5544.46**	
State Sector					4119.16	
Koyna I & II	600	600	882.8	13.61	869.22	-
Koyna III	320	320	611.7	2.35	609.36	-
Koyna IV	1000	1000	1745.3	11.36	1733.90	-
Koyna-DPH	40	40	105.6	0.19	105.39	-
Vaitarna	61.5	61.5	107.1	0.48	106.60	-
Tillari	60	60	10.4	0.26	10.10	-
Bhira TR	80	80	85.2	0.03	85.15	-
Vir & Bhatghar	25	25	73.0	0.97	72.03	-
Paithan	12	12	3.5	0.06	3.43	-
Pawana	10	10	10.6	0.15	10.49	-
Panshet	8	8	24.1	0.09	24.02	-
Varasgaon	8	8	36.6	0.09	36.53	-
Eldari	22.5	22.5	7.4	0.21	7.16	-
Bhandardara	44	44	36.7	0.02	36.71	-
Radhanagari	4.8	4.8	9.3	0.00	9.34	-
Bhatsa	15	15	66.8	0.23	66.59	-
Dhom	2	2	6.9	0.06	6.80	-
Kanhar	4	4	8.7	0.09	8.63	-
Ujjani	12	12	25.3	0.33	25.00	-
Manikdoh	6	6	4.1	0.03	4.08	-
Warna	16	16	57.3	0	57.27	-
Pench - share (33%)	53.33	53.33	75.9	0.59	75.27	-
Dimbhe	5	5	9.1	0.09	9.02	-
Surya	6.75	6.75	14.0	0.1	13.88	-
Dudhganga	24	24	62.0	0.00	62.03	-
Yeoteshwar	0.08	0.08	0.0	0.00	0.00	-
Terwanmedhe	0.2	0.2	0.1	0.00	0.09	-
Sardar sarovar (27%)	121.5	121.5	71.1	0.00	71.09	-
Private Sector					1425.30	
Khopoli	72	72	264.7	1.61	263.11	-
Bhivpuri	75	75	251.4	2.38	248.99	-
Bhira	150	150	337.3	2.05	335.27	-
Bhira PSU	150	150	579.6	1.65	577.93	-
Gas					**7386.07**	
State Sector					4021.07	
Uran	672	612	2668.523	9.92	2658.60	0.493
Uran WHR	240	240	1446.646	84.18	1362.47	0.493
Private sector					1304.23	
Trombay	180	180	1335.017	30.79	1304.23	0.493
Dhabol	740	740	0	0	0.00	0.493
Central sector					2060.77	
Kawas CGPP	656.2	656.2	2822.17	69.26	2752.91	0.499
Gandhar CGPP	657.4	657.4	4029.72	82	3947.72	0.499
Centre's Total	1313.6	1313.6	6851.87	151.3	6700.57	0.499
Centre's allocation	404	404	2107.30472	46.53258222	2060.77	0.499
Thermal					**61077.74**	
State Sector					39175.67	
Nasik	910	910	5694.053	524.68	5169.37	0.945
Koradi	1100	1080	6443.735	639.85	5803.89	0.965
Bhusawal	482.5	478	3291.306	318.84	2972.47	0.968
Parli	690	690	4894.584	440.19	4454.39	0.975
Khaparkheda	840	840	6287.789	558.72	5729.07	0.907
Chandrapur	2340	2340	15923.74	1229.11	14694.63	0.917
Paras	62.5	58	393.12	41.27	351.85	1.081
Private sector					11915.36	
Dahanu BSES	500	500	4439.177	334.13	4105.05	0.931
Trombay TPC	1150	1150	8175.648	365.34	7810.31	1.006
Central sector					9986.72	
KSTPS	2100	2100	17049.52	1124.25	15925.27	0.948
VSTPS	2260	2260	17820.86	1227.75	16593.11	0.948
Centre's Total	4360	4360	34870.37	2352	32518.37	0.948
Centre's allocation	1339	1339	10709.04253	722.3229358	9986.72	0.948
Nuclear					**1907.78**	
Centre's Total	760	760	5099.68	452.53	4647.15	-
Centre's allocation	312	312	2093.552842	185.7754737	1907.78	-

OM		**0.899**

Energy resources in MH from various Generating Units 2003-04

Order	Installed Cap.	Effective Cap.	Gross Generation	Auxiliary Consumption	Net Generation	EF
	MW	MW	MU	MU	MU	tCO2/MWh
Hydro					**5448.19**	
State Sector					4119.89	
Koyna I & II	560	600	785.0	14.16	770.83	-
Koyna III	320	320	604.3	3.75	600.59	-
Koyna IV	1000	1000	1825.6	10.96	1814.65	-
Koyna-DPH	40	40	103.5	0.18	103.33	-
Vaitarna	61.5	61.5	151.2	1.02	150.22	-
Tillari	60	60	65.5	0.33	65.15	-
Bhira TR	80	80	82.6	0.04	82.56	-
Vir & Bhatghar	25	25	48.9	0.49	48.40	-
Paithan	12	12	7.9	0.10	7.75	-
Pawana	10	10	10.5	0.09	10.42	-
Panshet	8	8	30.0	0.10	29.87	-
Varasgaon	8	8	28.2	0.16	28.03	-
Eldari	22.5	22.5	32.5	0.11	32.36	-
Bhandardara	44	44	25.1	0.12	25.03	-
Radhanagari	4.8	4.8	9.6	0.00	9.60	-
Bhatsa	15	15	54.6	0.25	54.35	-
Dhom	2	2	4.5	0.07	4.43	-
Kanhar	4	4	6.1	0.09	6.02	-
Ujjani	12	12	2.8	0.27	2.55	-
Manikdoh	6	6	4.3	0.01	4.29	-
Warna	16	16	53.8	1.84	51.98	-
Pench - share (33%)	53.33	53.33	153.4		153.39	-
Dimbhe	5	5	7.9	0.07	7.85	-
Surya	6.75	6.75	6.9	0.11	6.82	-
Dudhganga	24	24	49.6	0.45	49.19	-
Yeoteshwar	0.08	0.08	0.0	0.00	0.00	-
Terwanmedhe	0.2	0.2	0.2	0.00	0.24	-
Sardar sarovar (27%)	27	27	0.0	0.00	0.00	-
Private Sector					1328.31	
Khopoli	72	72	223.7	1.71	222.00	-
Bhivpuri	75	75	230.0	2.56	227.43	-
Bhira	150	150	345.5	2.08	343.38	-
Bhira PSU	150	150	537.1	1.58	535.50	-
Gas					**7374.72**	
State Sector					3917.07	
Uran	672	612	2680.807	11	2669.81	0.493
Uran WHR	240	240	1325.424	78.16	1247.26	0.493
Private sector					1389.75	
Trombay	180	180	1425.849	36.1	1389.75	0.493
Dhabol	740	740	0	0	0.00	0.493
Central sector					2067.90	
Kawas CGPP	656.2	656.2	3888.706	97.21765	3791.49	0.499
Gandhar CGPP	657.4	657.4	3220.204	64.40408	3155.80	0.499
Centre's Total	1313.6	1313.6	7108.91	161.62173	6947.29	0.499
Centre's allocation	391.0	391.0	2116.004727	48.10756427	2067.90	0.499
Thermal					**59065.80**	
State Sector					38340.81	
Nasik	910	910	5639.471	643.56	4995.91	0.945
Koradi	1100	1080	6269.625	643.56	5626.07	0.965
Bhusawal	482.5	478	3315.94	324.9	2991.04	0.968
Parli	690	690	4313.325	414.75	3898.58	0.975
Khaparkheda	840	840	5992.975	525.08	5467.90	0.907
Chandrapur	2340	2340	16227.416	1241.78	14985.64	0.917
Paras	62.5	58	418.914	43.23	375.68	1.081
Private sector					11334.38	
Dahanu BSES	500	500	4406.831	334.13	4072.70	0.931
Trombay TPC	1150	1150	7613.044	351.37	7261.67	1.006
Central sector					9390.62	
KSTPS	2100	2100	16331.686	979.90116	15351.78	0.948
VSTPS	2260	2260	16354.008	1128.426552	15225.58	0.948
Centre's Total	4360	4360	32685.694	2108.327712	30577.37	0.948
Centre's allocation	1339	1339	10038.10648	647.4887171	9390.62	0.948
Nuclear					**2016.74**	
Centre's Total	760	760	5671.065	510.39585	5160.67	-
Centre's allocation	297	297	2216.192507	199.4573256	2016.74	-

OM		**0.897**

Energy resources in MH from various Generating Units 2001-02						
Order	**Installed Cap.**	**Effective Cap.**	**Gross Generation**	**Auxiliary Consumption**	**Net Generation**	**EF**
	MW	MW	MU	MU	MU	tCO2/MWh
Hydro					**4949.52**	
State Sector					3654.26	
Koyna I & II	560	600	956.3	13.73	942.59	-
Koyna III	320	320	542.6	2.55	540.01	-
Koyna IV	1000	1000	1389.3	3.81	1385.45	-
Koyna-DPH	40	40	85.8	0.38	85.37	-
Vaitarna	61.5	61.5	126.8	0.84	125.95	-
Tillari	60	60	90.0	0.44	89.54	-
Bhira TR	80	80	67.2	0.03	67.18	-
Vir & Bhatghar	25	25	63.5	0.56	62.96	-
Paithan	12	12	6.9	0.11	6.74	-
Pawana	10	10	6.5	0.14	6.34	-
Panshet	8	8	22.5	0.15	22.39	-
Varasgaon	8	8	25.2	0.10	25.13	-
Eldari	22.5	22.5	28.0	0.15	27.81	-
Bhandardara	44	44	32.0	0.10	31.85	-
Radhanagari	4.8	4.8	6.8	0.05	6.75	-
Bhatsa	15	15	56.5	0.30	56.19	-
Dhom	2	2	5.4	0.07	5.31	-
Kanhar	4	4	4.7	0.10	4.60	-
Ujjani	12	12	6.9	0.23	6.69	-
Manikdoh	6	6	3.0	0.00	3.03	-
Warna	16	16	40.5	0	40.53	-
Pench - share (33%)	53.33	53.33	45.7		45.68	-
Dimbhe	5	5	11.3	0.00	11.33	-
Surya	6.75	6.75	12.7	0.13	12.58	-
Dudhganga	24	24	39.4	0.00	39.42	-
Majalgaon	0.75	0.75	0.0	0.00	0.00	-
Karanjwane	3	3	2.8		2.84	-
Sardar sarovar (27%)	0	0	0.0	0.00	0.00	-
Private Sector					1295.26	
Khopoli	72	72	219.7	1.67	218.03	-
Bhivpuri	75	75	225.3	2.83	222.47	-
Bhira	150	150	317.8	2.35	315.45	-
Bhira PSU	150	150	541.0	1.69	539.31	-
Gas					**7250.67**	
State Sector					3603.02	
Uran	672	612	2436.7	15.65	2421.05	0.493
Uran WHR	240	240	1255.01	73.04	1181.97	0.493
Private sector					1498.41	
Trombay	180	180	1239.54	36.58	1202.96	0.493
Dhabol	740	740	303.03	7.58	295.45	0.493
Central sector					2149.24	
Kawas CGPP	656.2	656.2	3753.819	93.845475	3659.97	0.499
Gandhar CGPP	657.4	657.4	3614.447	72.28894	3542.16	0.499
Centre's Total	1313.6	1313.6	7368.266	166.134415	7202.13	0.499
Centre's allocation	92.0	392.0	2198.812631	49.57726148	2149.24	0.499
Thermal					**57527.25**	
State Sector					37964.83	
Nasik	910	910	5660.14	505.58	5154.56	0.945
Koradi	1100	1080	6092.63	617.54	5475.09	0.965
Bhusawal	482.5	478	3363.69	352.79	3010.90	0.968
Parli	690	690	4421.89	433.94	3987.95	0.975
Khaparkheda	840	840	5509.55	486.22	5023.33	0.907
Chandrapur	2340	2340	16227.29	1240.83	14986.46	0.917
Paras	62.5	58	364.19	37.65	326.54	1.081
Private sector					10311.27	
Dahanu BSES	500	500	3762.45	334.13	3428.32	0.931
Trombay TPC	1150	1150	7235.19	352.24	6882.95	1.006
Central sector					9251.15	
KSTPS	2100	2100	16605.433	996.32598	15609.11	0.948
VSTPS	2260	2260	15589.82	1075.69758	14514.12	0.948
Centre's Total	4360	4360	32195.253	2072.02356	30123.23	0.948
Centre's allocation	1339	1339	9887.487103	636.3393456	9251.15	0.948
Nuclear					**2666.20**	
Centre's Total	760	760	6067.34	546.0606	5521.28	-
Centre's allocation	367	367	2929.886553	263.6897897	2666.20	-

OM		**0.897**

Region-wise Design Station Heat Rate for Thermal Power Plants

Region	2000-01	2001-02	2002-03	2003-04	2004-05
Northern	2483	2483	2491	2484	2484
Southern	2434	2434	2425	2490	2490
Western	2347	2347	2341	2357	2357
Eastern	2383	2383	2368	2365	2365

unit: Kcal/ Kwh

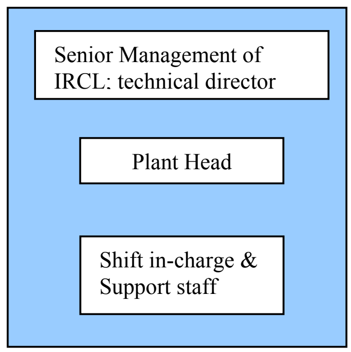
Source www.cea.nic.in

Annex 4

MONITORING PLAN

Project Management Plan:

A CDM project team is constituted with participation from relevant departments. People are trained on CDM concept and monitoring plan. This team will be responsible for data collection and archiving. This team will meet periodically to review CDM project activity check data collected, emissions reduced etc. On a weekly basis, the monitoring reports are checked and discussed by the seniors CDM team members/managers. In case of any irregularity observed by any of the CDM team member, it is informed to the concerned person for necessary actions. On monthly basis, these reports are forwarded to the management level.



Technical Director: Overall responsibility of compliance with the CDM monitoring plan.
Plant Head: Responsibility for completeness of data, reliability of data (calibration of meters), and monthly report generation
Shift In-charge: Responsibility of daily report generation

Data Monitoring:

The methodology requires monitoring of the following:

- Electricity consumption for all the processes i.e. clinker grinding, slag conveying, slag grinding, slag preparation, blending etc. from the project activity
- Data on clinker analysis from the sourcing plants
- Data on clinker & slag consumptions in PSC production
- Data on raw material analysis from the clinker sourcing plants

Completeness-

- Electrical energy consumptions are metered in-house for each process.
- Data on clinker analysis is done at the in-house laboratory of IRCL.
- Data on clinker, slag & other additives is recorded in the purchase & store sections logs
- Data on raw material i.e. limestone is taken from the clinker sourcing plants

Reliability-

- The reliability of the meters is checked by testing the meters every half yearly basis. Documents pertaining to testing of meters shall be maintained.

- The quality control section at IRCL shall taker care of the slag % in the PSC produced. A data log of this shall be maintained.

Frequency-
The frequency for data monitoring shall be as per the monitoring details in Section D of this document.

Annex 5

IRCL have been investing in a number of activities so as to make PSC technically at par with other cements, to create more application specific grades of PSC, to create awareness in the market place about the benefits of use of PSC through its technical & marketing efforts.

IRCL have focussed its promotion activities for all level of groups including builders, consultants, site engineers and mesons. They have also developed customized technical literature to guide users on PSC features and its right application. They have employed dedicated external experts other than their own technical people for the purpose. In past they have involved international experts also to create awareness about PSC in the region.

Product promotion activities are carried out for all levels of group who are influential in promoting /recommending use of PSC

There are four main categories;

1 Builder
2 Consultant
3 Site Engineers and;
4 Masons

Education and awareness program are scheduled at regular intervals to exchange thoughts on merits of using PSC the right way to use material is also demonstrated in practical manner at construction sites.

Technical seminars are organized at bigger platform to disseminate technical knowledge to leading consultants, structural engineers and key officials in public sector.

Dedicated presentations are arranged for specific client having large potential. In addition to the above, direct interaction with decision makers is established on regular basis.

Articles are submitted to various periodicals and participation in leading events/seminar events related construction is done on regular basis.

International experts are invited to deliver talk create confidence in elite class of engineers and specifies.

Customized technical literature is prepared to suitably guide users on product features and its benefit in construction

Technical articles published by the leading experts in slag cement are circulated through electronic media and through circulation to users, consultants and academicians, public sector undertakings.

IRCL was one of the first companies to promote PSC in Government sectors. IRCL had made many presentations to the Government officials to enhance PSC awareness, validating the PSC qualities by third party lab testing, and by receiving letter of approvals from Government departments like Municipalities, PWD Maharashtra etc

Annex 6

Glossary of Terms	
%	Percentage
BC	Blended Cement
BM	Build Margin
BIS	Bureau of Indian Standards
CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CER	Carbon Emission Reduction
CM	Combined Margin
CMA	Cement Manufacturer's Association
CO_2	Carbon Di Oxide
DNA	Designated National Authority
DOE	Designated Operational Entity
EIA	Environmental Impact Assessment
GEF	Grid Emission Factor
GHG	Green House Gases
GWh	Giga Watt Hour
IS	Indian Standards
IPCC	Intergovernmental Panel on Climate Change
IRCL	Indorama Cement Limited
Kg / kWh	Kilo Gram per Kilo Watt Hour
kg CO_2 equ/kWh	Kilo Gram Carbon Di Oxide equivalent per Kilo Watt Hour
kg/kWh	Kilo Gram per Kilo Watt Hour
KP	Kyoto Protocol
kW	Kilo Watt
kWh	Kilo Watt Hour
M & P	Modalities and Procedures
M & V	Monitoring and Verification
MNES	Ministry of Non-Conventional Energy Sources
MoEF	Ministry of Environment and Forests
MSEB	Maharastra State Electricity Board
MU	Miilion Units
MW	Mega Watt
NCV	Net Calorific Value
OM	Operating Margin
OPC	Ordinary Portland Cement
PPC	Portland Pozzolana Cement
PSC	Portland Slag Cement
Rs.	Indian Rupees
T & D	Transmission and Distribution
UNFCCC	United Nations Framework Convention on Climate Change

Annex 7

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Western Region Electricity Board website & annual reports: www.wrebgov.nic.in

National Hydroelectric Corporation website: www.nhpcindia.com

National Thermal Power Corporation website: www.ntpc.co.in

Nuclear Power Corporation of India Ltd website: www.npcil.nic.in