CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL-SCALE PROJECT ACTIVITIES (SSC-CDM-PDD)
Version 02

CONTENTS

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.

SECTION A. General description of the small-scale project activity

A.1. Title of the small-scale project activity:

ENERGY EFFICIENCY MEASURES AT CEMENT PRODUCTION PLANT

A.2. Description of the small-scale project activity:

Chittorgarh unit of Birla Corporation Limited (BCL) is one of the major cement production units in the state of Rajasthan, India. The BCL–Chittorgarh facility houses Chittor Cement Works (CCW) and Birla Cement Works (BCW) in the same premises. BCL-Chittorgarh unit mainly produces Ordinary Portland Cement (OPC) and Portland Pozzolona Cement (PPC). The project activity is an energy efficiency improvement initiative on part of the project proponent.

Purpose:

BCL – Chittorgarh unit produces OPC grade and PPC grade cement. The process is energy intensive and consumes both thermal and electrical energy. With the growing concern of cleaner production, the company had focused on energy efficient technologies. The basic objective of the project is to reduce energy consumption per tonne of cement production through implementation of energy efficient technologies at BCL-Chittorgarh.

The company identified the possible areas where improvement can be done. The main thrust areas were identified as flow control and use of more efficient electrical drives.

Salient Features of the Project:

Project participant has installed various technologically advanced instruments at BCL-Chittorgarh under its programme for energy efficiency improvement initiative. The efficiency improvement programme consists of:

- Installation of Variable Frequency Drives
- Replacement of existing equipments with high efficiency equipments
- Technology up-gradation for selected applications

Project's contribution to sustainable development

The reduction in power demand owing to energy efficiency measures indirectly reduces fossil fuel combustion and corresponding greenhouse gas (GHG) emission. Moreover, these efforts save the use of fossil fuel, a primary resource for power generation. Reduction in generation from thermal sources helps in associated pollution abatement. Some of the other sustainability issues addressed by the project are:

Social Well Being: As an enlightened corporate citizen, Birla Corporation Limited is keenly aware of its social responsibilities too, and besides providing education and health care facilities for its employees, their families and the community at large, the Group is involved in a number of philanthropic activities. The energy efficiency measures which result in a reduction in electricity demand on the state grid has its indirect social benefits through reducing the demand-supply gap and conservation of equivalent amount of non-renewable resources which otherwise would have been consumed to generate the same amount of electrical energy.

Environmental Well Being: The energy efficiency measures directly reduce the power consumption by the facility and thereby reduce demand at the power generation end (which is enhanced by the T&D loss). The reduction in power generation corresponds to the reduced fuel combustion, which implies reduced GHG emission and reduced emissions of air pollutants in transportation, mining of fuel and in fuel combustion.

A.3. Project participants:

Birla Corporation Limited

Contact person: Mr. V.S. Panwar, Vice President, Projects **(Details in Annex I)**

Name of party involved (host party)	Private and/or public entity (ies) project participants (as applicable	Kindly indicate if the Party involved wishes to be considred as project participant (Yes/ No)
Ministry of Environment and Forests, Government of India	Birla Corporation Limited; Unit: Chittorgarh	No

A.4. Technical description of the small-scale project activity:

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A.4.1. Location of the small-scale project activity:

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A.4.1.1. Host Party(ies):

India

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

Rajasthan

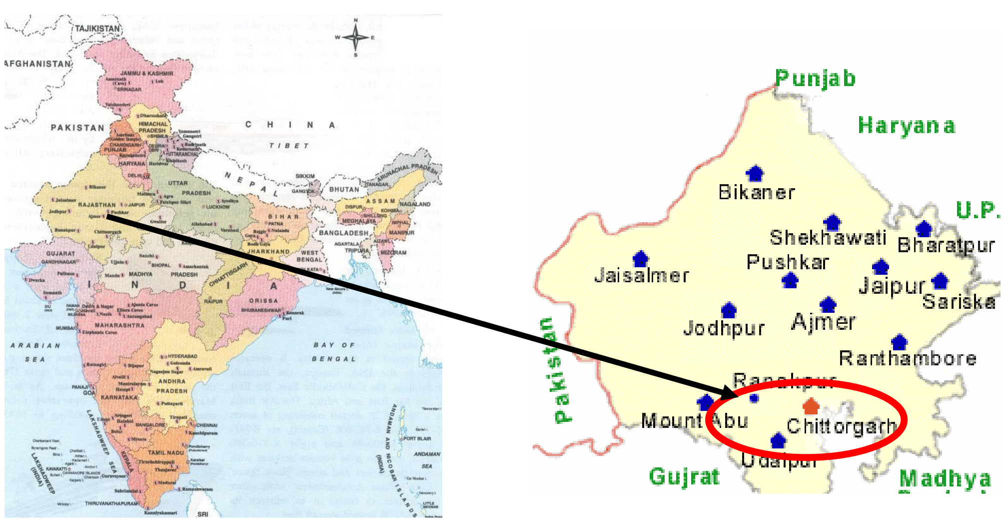
A.4.1.3. City/Town/Community etc:

Chittorgarh

A.4.1.4. Detail of physical location, including information allowing the unique identification of this small-scale project activity(ies):

The project is implemented at BCL-Chittorgarh. BCL-Chittorgarh is located near the city of Chittorgarh around 600 km to the south–west of Delhi, the national capital.

The project is implemented by Birla Corporation Limited.



Map not to Scale

A.4.2. Type and category(ies) and technology of the small-scale project activity:

The project activity involving energy efficiency measures at a BCL-Chittorgarh, falls under Type II of small scale CDM project activity as defined by the United Nations Framework Convention on Climate Change (UNFCCC).

Main category -**Type II [Energy Efficiency Improvement Projects]**

Sub Category - **D [Energy efficiency and fuel switching measures for industrial facilities]**

As per Appendix B of the UNFCCC-defined simplified modalities and procedures for small-scale CDM project activities, the aggregate energy savings from the project activity primarily aimed at energy efficiency measures, may not exceed the equivalent of 15 Giga-watt hour (GWh) per year, for the project to qualify as a small-scale CDM project under Category II.D.

The project consists of industrial energy efficiency improvement measures through technological up gradation and instrumentation. It reduces energy consumption on the demand side. As the net energy consumption reduction is less than 15 GWh /annum, project falls under **small-scale** Category II.D.

Project Activity with technology details

The project includes the Energy Efficiency and process improvement measures adopted in the form of technology upgradation and instrumentation in the plants.

The following measures are included under the project -

Activities implemented in the financial year (2000-01)

- Installation of Variable Frequency Drives in CCW
  - Provision of Variable Frequency Drive (VFD) in raw mill vent fan:

    Earlier raw mill vent fan damper was only 40% open for the required airflow. Since the damper opening was less, there was high-pressure loss across the damper resulting in higher power consumption. Keeping the damper opened fully and reducing the fan speed (rpm) could save on power consumption. Hence, VFD was proposed to be installed in raw mill vent fan which has resulted in power savings of 56 kW (0.41 kWh/t of clinker).

  - Provision of VFD in cooler fan *2R*[1] of grate cooler in CCW:

[1] This is an identification nomenclature for the particular cooler fan; all similar nomenclatures have been marked in italics beside the respective items.

Earlier damper of cooler fan *2R* was only 42% open for the required airflow. Since the damper opening was less, there was high-pressure loss across the damper resulting in higher power consumption. So keeping the damper opened fully and reducing the fan rpm could have saved power. Hence, VFD had been proposed to be installed in cooler fan *2R* and has resulted in a power savings of 10 kW (0.078 kWh/t of clinker).

- Technology up-gradation for selected applications
  - Modification of inlet duct of cooler fan *V5A*[1] of grate cooler at CCW:

Modification of inlet duct of cooler fan *V5A* was done resulting in power savings of 6 kW (0.046 kWh/t of clinker). The diameter of the inlet duct has been increased to reduce the friction loss and pressure loss during flow of air through the duct.

<u>Activities implemented in the financial year (2001-02)</u>

- Installation of Variable Frequency Drives
  - Provision of VFD in cooler fan *2L* of grate cooler in CCW :

Earlier vent fan damper was only 47% open for the required airflow. Since the damper opening was less, there was high-pressure loss across the damper resulting in higher power consumption. So keeping the damper opened fully and reducing the fan rpm could have saved power. Hence, VFD was proposed to be installed in cooler fan *2L* and has resulted in power savings of 23.83 kW (0.173 kWh/t of clinker).

- Provision of VFD in cooler fan *V5A* in CCW:

Earlier vent fan damper was only 46% open for the required airflow. Since the damper opening was less, there was high-pressure loss across the damper resulting in higher power consumption. So keeping the damper opened fully and reducing the fan rpm could have saved power. Hence, VFD was proposed to be installed in cooler fan *V5A* and has resulted in power savings of 14.73 kW (0.107 kWh/t of clinker).

- Provision of VFD in cooler fan *V5B* of grate cooler in CCW:

Earlier vent fan damper was only 46% open for the required airflow. Since the damper opening was less, there was high-pressure loss across the damper resulting in higher power consumption. So keeping the damper opened fully and reducing the fan rpm could have saved power. Hence, VFD was proposed to be installed in cooler fan 2R and has resulted in power savings of 6.12 kW (0.044 kWh/t of clinker).

- VFD for Raw Mill # *1 & 2* vent fans in BCW:

VFDs were installed in raw mill *1 & 2* vent fans resulting in the power savings of 20.54 kW (0.25 kWh/t of Clinker).

- Installation of VFD & replacement of coal mill # 1 Bag Dust Collector (BDC) Fan in BCW:

Modification of coal mill # *1* BDC was done and VFDs were installed in the same resulting in the power savings of 12.70 kW (0.11 kWh/t of clinker).

- Technology up-gradation for selected applications
  - Bucket Elevators for kiln feed of kiln # *1 & 2* in BCW:

The pneumatic transport systems for kiln feed in kiln # *1 & 2* were replaced with mechanical transport system resulting in the power savings of 103.89 kW (1.24 kWh/t of clinker).

<u>Activities implemented in the financial year (2002-03)</u>

- Technology up-gradation for selected applications
  - Modification of pre heater cyclones, rise duct, down comer, pre-heater fan, Electrostatic Precipitator (ESP) fan & provision of tertiary crusher of raw mill in CCW:

Earlier CCW kiln was operating at 2800 tonnes per day (tpd) with conventional cyclones at pre heater. The operating capacity of CCW kiln was increased to 3300 tpd by replacing the pre-heater cyclones *2, 3 & 5* to low pressure type, replacing the ESP & pre-heater fans with high efficiency fans and modification of riser ducts. Also the capacity of the raw mill was increased by installation of tertiary crusher in the raw mill. All of these activities were clubbed together which resulted in energy savings of 3.41 kWh/ t of clinker.

- Provision of six dip tubes in raw mill section in CCW:

The efficiency of *O-sepa* separator could be increased as well as substantial amount of power could be saved by installation of six dip tubes in multi cyclones. This activity has resulted in the power savings of 4 kW (0.026 kWh/t of clinker).

- Bucket Elevators for raw mill transport from Raw Mill # *1 & 2* to homo silos in BCW:

The pneumatic transport system from raw mill # *1 & 2* to homo silos in kiln # *1 & 2* was replaced with mechanical transport system resulting in the power savings of 226 kW (2.26 kWh/t of clinker).

- Installation of Variable Frequency Drives
  - Installation of VFD & replacement of Coal Mill # *2* BDC fan in BCW:

  Replacement of Coal Mill # *2* BDC fan was done and VFDs were installed in the same resulting in the power savings of 21.50 kW (0.21 kWh/t of clinker).

- Replacement of existing equipments with more efficient equipments
  - Replacement of Cement Mill # *2* vent fan in BCW:

  Replacement of Cement Mill # *2* vent fan was done, resulting in the power savings of 13.50 kW (0.13 kWh/t of clinker).

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

The project activity includes a host of energy efficiency measures in the form of modification in the present grinding system through technology up-gradation. All these improved technology measures had helped in reducing the direct demand of electricity and indirect demand of fossil fuel (coal) in view of the fact that in absence of these measures an equivalent amount of electricity would have been drawn from the Rajasthan Vidyut Prasaran Nigam Ltd (RVPNL) Grid dominated by supply from thermal power plants fed by coal.

The energy efficiency measures would reduce the indirect coal combustion. The reduction in specific electricity consumption for cement production reduces equivalent amount of carbon dioxide emissions into the atmosphere. The estimated emission reductions from the project activity would be around **56266 t of CO_2 equivalent during the 10 years crediting period.** (Refer to Enclosure 4 for detailed calculations)

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

Years	Annual estimation of emission reductions in tonnes of CO_2 e
2001-2002	445
2002-2003	1644
2003-2004	6772
2004-2005	6772
2005-2006	6772
2006-2007	6772
2007-2008	6772
2008-2009	6772
2009-2010	6772
2010-2011	6772
Total estimated reductions (tonnes of CO_2 e)	**56266**
Total number of crediting years	**10**
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	**5626**

A.4.4. Public funding of the small-scale project activity:

No public funding from parties included in Annex – I of Kyoto Protocol is available so far to the project.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a larger project activity:

According to **Appendix C of Simplified Modalities & Procedures for small scale CDM project activities**, ***'Debundling'*** is defined as the fragmentation of a large project activity into smaller parts. A small-scale project activity that is part of a large project activity is not eligible to use the simplified modalities and procedures for small-scale CDM project activities.

A proposed small-scale project activity shall be deemed to be a de-bundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

In BCL-Chittorgarh's case, it clearly does not fall under the debundled category and qualifies as a small scale CDM project. The different components of the energy efficiency project activity under consideration are not actually parts of a bigger project activity. These components belong to the same category (energy efficiency) but all these are individual and independent projects taken in different units of the same manufacturing facility of BCL-Chittorgarh. It is the single such project of the promoters. The conditions in paragraph 2 of Appendix C confirm that the small-scale project activity is not a debundled component of a larger project activity.

SECTION B. Application of a baseline methodology:

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

Title: ENERGY EFFICIENCY IMPROVEMENT PROJECTS – Energy Efficiency measures for industrial facilities – Category II.D

Reference: Appendix B of the simplified modalities and procedures for small-scale CDM project activities - indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories (Version 05: 25 February 2005).

This appendix has been developed in accordance with the simplified modalities and procedures for small-scale CDM project activities (contained in Annex II to decision 21/CP.8, see document FCCC/CP/2002/7/Add.3). Baseline Methodology specified for Category II.D project activities in this Appendix has been followed for BCL's project at Chittorgarh.

B.2 Project category applicable to the small-scale project activity:

Appendix B of the simplified M&P for small-scale CDM project activities of the UNFCCC CDM website, provides guidelines for preparation of Project Design Document (PDD) including baseline calculations.

The project activity conforms to "Category II.D" in Appendix B. The project activity includes measures to improve the energy efficiency of cement production processes that reduces electrical energy consumption on the demand side. The reduction is within the upper cap of the small scale CDM project activity under Category II.D (i.e., up to the equivalent of 15 GWh per year). Annual average reduction in electrical energy consumption is of the order of 6.18 GWh. Thus the baseline methodology prescribed by the UNFCCC in Appendix B to Simplified M&P for small scale CDM projects activities belonging to Category II.D, is justifiably applicable for the project activity.

A complete analysis of Rajasthan's electricity grid has been carried out along with the study of various related issues like technology scenario, policy matters, economic conditions, etc. for preparation of baseline scenario and calculation of baseline emission factor of the grid.

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 small-scale CDM project activity:

As per the decision 17/CP.7 paragraph 43, a CDM project activity is additional if anthropogenic emissions of GHGs by sources are reduced below those that would have occurred in the absence of the registered CDM project activity. The project activity includes energy efficiency improvement measures with net CO_2 emission reductions due to reduced specific electricity consumption patterns in the cement plant.

BCL-Chittorgarh decided to take up the project execution, in phases as a step towards climate change activity after Kyoto Protocol came into existence. The project activity was initiated to reduce the carbon dioxide emissions by sources and would otherwise not have been implemented due to the existence of the operational barrier(s) discussed below. The continued investment in phases has been influenced by the Clean Development Mechanism (CDM) related development at the United Nations Framework Convention on Climate Change.

Additionality test based on barriers to the project activity

Barriers to the project activity

The BCL-Chittorgarh unit was one of the first cement industries of its type in the same social, economic and regional class in the cluster, to identify the areas where the improvement in cement grinding could be adopted and electrical energy consumption and its associated emissions could be reduced. The measures adopted were a proactive step towards GHG emission reductions. The barriers to the project activity would be dealt in following two steps. In first steps, the general barriers are discussed and in step two, how CCW has overcome these barriers to avail CDM benefits.

Step I: General barrier to Energy Efficiency projects in India[2]:

Status of Energy Efficiency in India

As per Bureau of Energy Efficiency (BEE), under Ministry of Power Govt. of India (the nodal body responsible for energy efficiency improvement in India and empowered for implementation of Energy Conservation Act 2001), there are several barriers present in Indian energy and industry sector that needs to be removed. India's energy intensity per unit of GDP is higher by 3.7 times of Japan, 1.4 times of Asia and 1.5 times of USA, indicating not only a very high energy wastage but also potential of substantial energy saving.

[2] www.bee-india.org (Bureau of Energy Efficiency, Government of India)

Industrial sector in India is a major energy user, accounting for about 48% of the commercial energy consumption. Energy saving potential is up to 30% through retrofitting in this sector. Some of the estimates made by different study reports for energy conservation in energy intensive industries are given in table below.

Table- : Scope for Energy Conservation in Energy – Intensive Industries

Data	Aluminum	Textile	Chlor Alkali	Petro chemicals	Fertilizer	Sugar	Paper	Cement
Energy Consumption (million Gcal)	30.1	52.5	20.0	5.8	112	100	26	67
Energy cost as a % of manufacturing Cost	40	13	30-35	7	60	12	25	40
Scope of energy conservation (%)	15-20	20-25	15	15	10	20	20	10

Barriers to Energy Efficiency

Considerable untapped potential exists for curbing waste of energy estimated to be of the order nearly 30 per cent of the total consumption of commercial energy. BEE observes that in spite of many efforts and benefits of energy efficiency several technical financial market and policy barriers have constrained the implementation of energy efficiency projects.

(a) Lack of Awareness: The main barrier to energy conservation is the lack of awareness of industry managers of the potential gains from improved efficiency. Industries as well as the Government and customers, are yet to take into consideration factors such as tax credits, depreciation benefits, electricity price escalation, and life cycle savings of the investment.

(b) Lack of Widespread Education and Training: Shortage of widespread educational opportunities in energy management and conservation and appropriate facilities; lack of trainers and auditors.

(c) Economic and Market Distortions: Irrational response to conservation measures because of inappropriate pricing and other market distortions, or socio-economic factors.

(d) Lack of Standardization and Labeling of Equipment / devices: Slow rate of progress in achieving higher standards of energy consumption in equipment and appliances.

(e) Lack of financing: The lack of credit and the inability to obtain financing for projects are strong deterrents to investments in energy efficiency in India.

(f) Lack of Effective Co-ordination: In India, the lack of effective national-level coordination and promotion of energy conservation activities have been a major constraint to achieving energy efficiency.

In spite of having a large potential for the net energy efficiency improvement has not happened owing to the above mentioned barriers. The market potential for investments in energy efficiency measures is very large and presently only captured by about 20% in India[3].

Step II: Barriers for BCL-Chittorgarh

BCL-Chittorgarh, has been producing cements in the Chanderia cluster of Rajasthan, India over last three decades. The company was subjected to the above said barriers and in absence of any dedicated energy managers, or specific energy management plans the company was not been able to take up major energy efficiency improvement initiatives. The organization had taken up only small energy efficiency initiatives in the late nineties as a part of process efficiency improvements. However, the concept of Clean Development Mechanism in the late nineties has acted as an additional motivator for taking up additional risks with energy efficiency projects that influenced BCL in deciding on implementation of energy efficiency projects..

Till the time of project conception, only four major cement plants were there in the cluster. Out of these, BCL –Chittorgarh is one of the oldest plants with similar technology (1965) and Aditya Cement was the latest one established in the year 1995. The energy performances of the cement industries in the cluster are provided below[4].

Plant Name	Electrical Energy (kWh/t Cement) (2001-2002)
Vikram Cement, Grasim Industries	94
Birla Corporation Ltd- Chittorgarh	91
J.K.Cement, Nimbaheda	101
Aditya Cement, Chittorgarh	84

In spite of operating in the same cluster (i.e. with similar raw materials and environmental conditions), it is clear that the specific energy consumption of BCL-Chittorgarh is better than other two large cement plants (Aditya Cement being a new plant, installed 30 years later that enjoys the benefit of present technological development). BCL-Chittorgarh on the other hand being the oldest plant of the rest lot has

3 http://www.energymanagertraining.com/kaupp/Article25.pdf

4 http://www.bee-india.com/presentations/cement/Targets.zip

been able to reduce the specific consumption level due to its initiatives above common practices followed. The initiatives taken by them indirectly reflect the additional efforts put in behind the project activity. The project proponent had taken risks in investing in the projects that were not practiced in general in the cluster and were not sure about the success of the retrofit measures.

Technological Barrier:

The activity involves high risk of failure as the plants are originally designed in 1965 and the technology chosen for up-gradation are of late ninety's. The basic design of cement plants, the quality of raw material, clinker and the mill characteristics have changed over the years. The technologies adopted under the project activity and the investment made involved higher risks in comparison with capacity expansion plans to meet the demand and avail the benefit of economy of scale. The retrofit measures always have performance risks as the benefits in most cases are assumed rather than depending on accurate calculations. However, the project proponent had gone ahead with the implementation risking the net production and market share.

Investment Barrier

Also it is important to note that the company had taken the decision in spite of its poor financial performance during the past 5-6 years when it was making losses. The company invested over 80 Million INR on the project activity despite its poor economic health.

Additionality test for Regulatory/Legal requirements

There was no legal binding on BCL-Chittorgarh to take up the project activity.

From the above analysis of barriers for the project activity we can conclude that the project activity is not a baseline scenario and without the project activity the pre-project phase would have continued with no reduction in the electrical energy consumption and its associated GHG emission reductions. The CDM project activity is additional and will help to reduce 56266 tonnes of CO_2 in 10 years of crediting period, calculated as per the approved baseline and monitoring methodologies of the Simplified Modalities and Procedures for Small Scale CDM Project Activities [details provided in section E].

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

As per the Appendix B of simplified M&P for small-scale CDM project activities "the project boundary is the physical, geographical site of the industrial facility, processes or equipment that is affected by the project activity."

In BCL-Chittorgarh, the project boundary covers the cement and clinker production units. The boundary starts from raw material input to the plant to final cement despatch. It also includes all energy inputs in the system

B.5. Details of the baseline and its development:

Since the project activity is feeding power to RVPN grid, the baseline for this project activity is the function of the generation mix of Rajasthan state grid. Using the methodology available for small-scale project activities, the average of operating and build margin (in kgCO_2 equ/kWh) of current generation mix of Rajasthan is used for the calculation of baseline. Actual CO_2 emission factors are used for the purpose.

The baseline study is a two-step study conducted to determine the baseline emissions over the crediting period in absence of project activity.

Step – I: Determination of Energy Baseline
Step – II (a): Choice of the grid - The current delivery system is studied for selection of a realistic grid representing the factual scenario associated with the project activity
Step – II (b): Determination of carbon intensity of the chosen grid – Rajasthan's power generation, present generation mix, sector wise installed capacities, emission co-efficient, station heat rate and generation efficiencies are used to arrive at the net carbon intensity/baseline factor of the chosen grid.

The baseline emissions and the emission reductions from project activity are estimated based on the carbon intensity of the chosen grid and the quantum of reduced electricity consumption due to implementation of the project activity.

STEP – I: Determination of the Energy Baseline (before implementation of project activity)

Power Savings by Project Activity

The project activity will save 6.18 million units of electricity per annum on an average. Therefore, a conventional energy equivalent of 61.8 million kWh for a period of 10 years would be conserved by the project activity. Without the project activity, the same energy load would have been taken up by power plants in the grid and emission of CO_2 would have occurred due to coal combustion (proportional to the share of thermal power in generation mix).

Energy Baseline

The annual energy baseline values (annual energy consumption in absence of project activity) for the crediting years are calculated by monitoring the "power that would be consumed" and "operating hours" of the devices installed based on the guidance provided in paragraph 6(a), (b) and (c) of Category II.D projects under Appendix B.
The "power that would be consumed" by the device(s)/process in absence of the project activity is recorded from the nameplate data or equipment's purchase details and the "operating hours" of device are recorded using run time metering.

STEP – II (A): Choice of the Grid

Indian power grid system (or the National Grid) is divided into five regional grids namely Northern, North Eastern, Eastern, Southern and Northern Region Grids. The Northern Regional Grid consists of Delhi, Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab, Rajasthan, Uttar Pradesh, Uttaranchal, Chandigarh state sector grids. These state grids have independent Load Dispatch Centres (LDCs) that manage the flow of power in their jurisdiction. That is, the state load dispatch centres along with State Electricity Regulatory Commission, solely determines the grid mix and grid discipline. Therefore any addition/alteration of demand is to affect the functioning of the grid that is controlled by State Regulatory Commission. We may therefore conclude that Rajasthan Grid is the most representative system boundary for the project activity.

We would therefore determine the carbon intensity of the Rajasthan state grid in Step II (b) to arrive at the baseline emission factor for baseline emission calculations for the project activity's crediting period.

STEP–II (b): Determination of carbon intensity of the chosen grid

Carbon emission factor of grid

Rajasthan's power generation, Present generation mix, sector wise installed capacities, emission co-efficient and generation efficiencies are used to arrive at the net carbon intensity/baseline factor of the chosen grid. As per the provisions of the proposed methodology the emission coefficient for the electricity displaced would be calculated in accordance with provisions of paragraph I.D.6 of Appendix B of Simplified Modalities and Procedures for Small Scale CDM Project Activities [Reference: FCCC/CP/2002/7/Add.3, English, Page 21] for grid systems.

The provisions of paragraphs I.D.6 of Appendix B requires the emission coefficient (measured in kg CO2equ/kWh) to be calculated in a transparent and conservative manner as:

The average of the "approximate operating margin" and the "build margin" (or combined margin)

OR

The weighted average emissions (in kg CO2equ/kWh) of the current generation mix.

Complete analysis of the system boundary's electricity generation has been carried out for the calculation of the emission coefficient as per point I.D.6 (a) given below with baseline emission factor calculations.

Combined Margin

The baseline methodology suggests that the project activity will have an effect on both the operating margin (i.e. the present power generation sources of the grid, weighted according to the actual participation in the state grid mix) and the build margin (i.e. weighted average emissions of recent capacity additions) of the selected Rajasthan grid and the baseline emission factor would therefore incorporate an average of both these elements.

Operating Margin

As mentioned above the project activity will have some effect on the Operating Margin (OM) of the Rajasthan State Grid. The carbon emission factor as per the Operating Margin takes into consideration the present power generation mix of 2003-2004 excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation of the selected grid, efficiency of thermal power plants and the default value of emission factors of the fuel used for power generation.

The consumer of a state of Rajasthan gets a mix of power from the different sources. The figures of installed power capacity, share of the state in the central pool, and actual plant availability decides the content of power. The real mix of power in a particular year is however based on actual units generated from various sources of power. The power system in Rajasthan comprises of Rajsthan Rajya Vidyut Utpadan Nigam Ltd. – generating company, RVPNL – transmission company and three regional distribution companies namely Jaipur Vidyut Vitran Nigam Ltd, Ajmer Vidyut Vitran Nigam Ltd and Jodhpur Vitran Nigam Ltd. RVPNL is operating major thermal and hydel power stations in Rajasthan. The state also gets share from the central sector generation plants and interstate power projects. The data collected and used are presented in Tables B 3.1 and Table B 3.2

The most important parameter in estimating the emissions is the thermal efficiency of the power plant. The net energy consumption norms were based on best efficiency for each of the technologies considered. As per the CEA report, it is assumed that all the coal & lignite based plants coming up in tenth & eleventh & plan will use pulverized coal sub-critical / super critical pressure technology with the thermal efficiency of around 34%. The percentage of carbon that is not burnt is very low and, hence, complete combustion was assumed. The thermal efficiency of existing old power plants is less than 30% and for new modern power plants it is expected to be around 34%. Central Electricity Authority has presented the analysis of Station Heat Rates (SHR) for 43 thermal power plants using coal, in India, in the report 'Performance Review of Thermal Power Stations 2003-04 Section 13'[5]. As per this report 'Suratgarh thermal power plant' (located in Rajasthan) has the second highest efficiency of 35.26 % among all the coal based power plants in Northern grid. Lehra Mohabbat, a plant located in Punjab has the highest efficiency of 35.51 %. But this plant does not supply electricity to Rajasthan grid. Hence the efficiency of 'Suratgarh thermal power plant' has been considered for the calculations. Average efficiency of gas based thermal plants in Rajasthan as against the standard norms works out to be around 40-45% On conservative basis average efficiency for base line calculations is considered as 50%. Standard emission factors given in IPCC for coal and gas (thermal generation) are applied over the expected generation mix and net emission factors are determined.

The formulae are presented in Section-E and the calculations are presented in an excel sheet Enclosure 4. Carbon Emission Factor of grid as per OM is 0.93 kg CO_2/kWh electricity generation.

[5] http://cea.nic.in/opm/0304/sec-13_sush777.pdf

Build Margin

The project activity will have some effect on the Build Margin (BM) of the Rajasthan State Grid. The baseline factor as per the Build Margin takes into consideration the delay effect on the future projects and assumes that the past trend will continue in the future. As per the baseline methodology, the baseline factor for Build Margin is calculated as the weighted average emissions of recent capacity additions to the system, which capacity additions are defined as the greater (in MWh) of the most recent 20% of existing plants or the 5 most recent plants. Since some major thermal plants have started operation in the year 2003 we have considered them during built margin calculations. In case of Rajasthan grid the capacity additions (in MWh) of most recent 20% of the existing plants are greater than that of 5 most recent plants. The data is presented in Table B 3.3 to Table B 3.5. The thermal efficiencies of coal and gas based plants for calculating build margin has been assumed same as that for calculating operating margin. The formulae are presented in Section-E and the calculations are presented in an excel sheet Enclosure 4. Carbon Emission Factor of grid as per BM is 0.89 kg CO_2/kWh electricity generation.

Net Carbon Emission Factor of Grid for 2003-2004 as per CM = (OM + BM)/2 = 0.91 kg of CO_2 / kwh generation respectively. (Refer to Excel Sheet-Enclosure 4).

Note: All baseline data has been provided in Enclosure 3

SECTION C. Duration of the project activity / Crediting period:

C.1. Duration of the small-scale project activity:

C.1.1. Starting date of the small-scale project activity:

March 2000

C.1.2. Expected operational lifetime of the small-scale project activity:

15 years

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

C.2.1. Renewable crediting period:

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

C.2.1.2. Length of the first crediting period:

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

March 2000

C.2.2.2. Length:

10 years

SECTION D. Application of a monitoring methodology and plan:

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

As per Appendix B of the simplified M&P for small-scale CDM project activities for Industrial energy efficiency projects,
In the case of retrofit measures, monitoring shall consist of:

(a) Documenting the specifications of the equipment replaced:

(b) Metering the energy use of the industrial facility, processes or the equipment affected by the project activity;
(c) Calculating the energy savings using the metered energy obtained from sub-paragraph '(b)'

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

The Project activity includes the whole BCL-Chittorgarh production plants where installation of energy efficient equipment and technological up gradation have resulted in substantial amount of reduction in specific energy consumption thereby resulting in GHG reductions. Hence, emission reductions quantity totally depends on the units of energy (kWh) saved at the grid by the project activity undertaken in the plant.

Description of Monitoring Plan

BCL-Chittorgarh made a voluntary commitment for reducing green house gas emissions. A proper Monitoring & Verification (M&V) Plan has been developed by BCL-Chittorgarh for proper monitoring and verification of actual emission reduction.

The Monitoring and Verification (M&V) procedures define a project-specific standard against which the project's performance (i.e. GHG reductions) and conformance with all relevant criteria will be monitored and verified. It includes developing suitable data collection methods and data interpretation techniques for monitoring and verification of GHG emissions with specific focus on technical / efficiency / performance parameters. It also allows scope for review, scrutinize and benchmark all these information against reports pertaining to M&V protocols.

The project activity's revenue is based on the units (kWh) saved in comparison to the units (kWh) consumed before the implementation of the project, measured by power meters at plant. The monitoring and verification system would mainly comprise of these meters as far as power import and savings of energy are concerned.

The other project specific parameter and performance indicators are: -

- Specific electrical energy consumption by the equipment
- Operating hours of the particular equipment under project activity.

Monitoring and verification of raw material characteristics (physical characteristics)/ quality is also required to be monitored as it could influence change in efficiency of the equipment and hence the quantum of emission reductions in tonnes of CO_2 equivalent.

The project employs the state of art monitoring and control equipment that measure, record, report, monitor and control mentioned key parameters. The instrumentation systems for monitoring of the project mostly comprise microprocessor-based instruments of reputed make with desired level of accuracy. All instruments are calibrated and marked at regular intervals so that the accuracy of measurement can be ensured all the time.

Justification of choice of methodology

Project activity includes installation of modernized energy efficient equipment, replacing the old ones consuming more electricity

The project monitoring includes:

- Monitoring of new installed equipment,
- Metering the specific electrical energy consumption by the specified equipment and
- Calculating the difference in specific electrical energy consumption after and before project implementation, which is equivalent to total energy saved at the grid.

According to UNFCCC released document for choice of monitoring methodology - Appendix B of the simplified M&P for small-scale CDM project activities also suggest the same for similar Project to BCL-Chittorgarh in the Paragraphs 6 (a) (b) & (c) under Category II.D projects..

The quantity of emission reduction unit claimed by the project will be based on the total electrical energy saved by the project. Therefore it is justified to check the total consumption of power by the individual project activity of BCL-Chittorgarh and comparing the specific units consumed with pre-project stage historical data of electricity consumption of the said boundary.

Project Parameters affecting Emission Reduction: -

The parameters that affect project emission are as follows:

a) Quality of material input that the equipment handle
b) Quality of energy input to the equipment
c) Operating parameter and product quality.

The current generation mix of RSEB and captive generation are being identified as the system which would be influenced by the project; hence for baseline emission calculation data will be collected from RSEB and captive consumption. RSEB publishes yearly reports regarding the performance of all power generation units (which include private sector generation units and RSEB's own generation units). Hence, authentic data related to the measurements, recording, monitoring and control of the generation mix of the RSEB network is ensured. The statutory financial audit for the plant ensures the accuracy and reliability of captive generation data.

The RSEB report contains all information regarding type of generation like hydro, thermal, nuclear, renewable *etc*., installed capacity, de-rated capacity, performance of generating unit, actual generation, capacity additions during the year, *etc*. which can be used for verification of generation mix and emission factors for baseline calculation for a particular year.

GHG Sources

There is no direct onsite emission from the project activity. Also there had been no additional construction work involved for project specific requirement resulting in no indirect onsite emission. The indirect off-site GHG source is the emission of GHG's that are involved in the process of transportation for procurement of equipment. However, considering the life cycle assessment of the total power saved and the emissions to be avoided in the life span of 20 –25 years; emissions from the above-mentioned source are too small and hence neglected. Project positively reduces GHGs at the thermal power unit connected to the RSEB grid and at captive generation unit as direct off -site reduction.

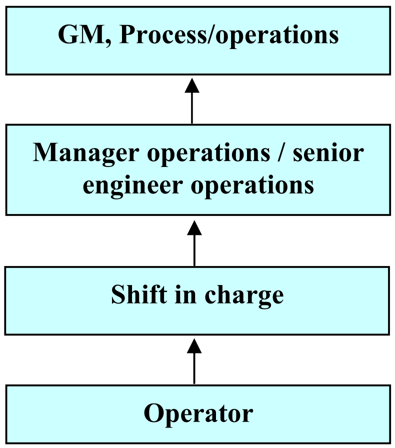
D.3 Data to be monitored:

ID number	Data type		Data variable	Data unit	Will data be collected on this item? (If no, explain).	How is data archived? (electronic/paper)	For how long is data archived to be kept?	Comment
D.3.1	Energy consumption		Specific electrical energy for individual activity	kWh/t of clinker	To be calculated from collected data.	Paper & Electronic	2 years after completion of crediting period	
D.3.2	Time		Operating hours of the equipment	Hour	Yes	Electronically online system/ daily log sheet	2 years after completion of crediting period	
D3.3	Power		Power consumption by equipment	kW	Collected based on random sampling	Electronically online system/ daily log sheet	2 years after completion of crediting period	
D.3.4	Energy	Sector wise power generation for baseline calculation (all sources)	Million kWh	Published document of RSEB		Paper	2 years after completion of crediting period	

D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

Regular calibration of energy meter has been undertaken by third party. The amount of material ground is measured. Same can be verified from silo measurement which is subjected to financial audit also.

D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:



D.6. Name of person/entity determining the monitoring methodology:

Plant professionals and Consultants of BCL- Chittorgarh

SECTION E. Estimation of GHG emissions by sources:

E.1. Formulae used:

E.1.1 Selected formulae as provided in appendix B:

No specific formula has been provided in Appendix B of the simplified M&P for small-scale CDM project activities for the said project category.

E.1.2 Description of formulae when not provided in appendix B:

The project activity draws power from the Rajasthan State Grid and the net effect of the project activity is reflected wholly on it. Therefore the grid scenario is analysed and the net baseline factor based on the combined margin approach is calculated considering all the plant contributing to the grid and the build margin of the most recent power plants are taken into consideration in a most conservative manner as per the guidelines provided in paragraph 7 under Category I.D in Appendix B of the simplified M&P for small-scale CDM project activities.

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

The project activity does not result in any GHG emissions within or beyond the project boundary.

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities

There is no leakage from the project activity. However the performance of the system may degrade over time and the efficiency may drop down which has to be taken into due account at the time of verification. This would be reflected in the specific kWh consumption across project boundary.

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the small-scale project activity emissions:

Nil.

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities:

Formulae used for estimation of the anthropogenic emissions by sources of greenhouse gases of the baseline are provided:

Calculation of Baseline Emission Factor of the grid mix

Operating Margin

Formulae:

A. Baseline Power generation

$P_{gr} = P_{tot} - P_{lrc}$ where,

Sl. No.	Symbolic Representation	Illustration
1.	P_{tot}	Power generation by all sources of grid mix.
2.	P_{gr}	Power generation by all sources without low running cost plants
3.	P_{lrc}	Power generation by low running cost plants

B. Sectorwise baseline Power generation

$P_{n\%} = \frac{P_n}{P_{gr}} x100$ where,

Sl. No.	Symbolic Representation	Illustration
1.	$P_{n\%}$	Share (in %) of power generation by each fuel used (coal and gas in present scenario), out of total power generation excluding power from low running cost plants.
2.	P_n	Power generation by fuel used. (in Million kWh units)
3.	P_{gr}	Power generation by all sources, without low running cost plants.

C. Calculation of Operating Margin emission factor

$$OM_{gr} = \sum \frac{3.6 \otimes P_{n\%} \otimes E_n}{Eff_n}$$ where,

Sl. No.	Symbolic Representation	Illustration
1.	OM_{gr}	OM Emission factor of baseline (tCO_2/GWh)
2.	E_n	Emission factor (actual) for each fuel type considered (e.g. coal, gas).
3.	$P_{n\%}$	Share (in %) of power generation by each fuel used (coal and gas in present scenario), out of total power generation excluding, power from low running cost plants.
4.	Eff_n	Efficiency for each fuel type.

Build Margin

Formulae:

A. Power generation from each project type of the cohort of plants identified

$$P_{n\%} = \frac{P_n}{P_{gr}} x100$$ where,

Sl. No.	Symbolic Representation	Illustration
1.	$P_{n\%}$	Share (in %) of power generation by each project type / fuel used (n = types e.g. coal, natural gas, diesel, hydro) out of total power generation from recent capacity additions
2.	P_n	Power generation by project types/fuel used (n = types e.g. coal, natural gas, diesel, hydro) from recent capacity additions to the system, which capacity additions defined as the greater (in MWh) of most recent[6] plants constituting to 20 per cent[7] of gross generation or the 5 most recent plants
3.	P_{gr}	Total power generation from recent capacity additions to the system, which capacity additions defined as the greater (in MWh) of most recent plants constituting to 20 per cent of gross generation or the 5 most recent plants

[6] Generation data available for the most recent year.
[7] If 20% falls on part capacity of a plant, that plant is included in the calculation.

B. <u>Calculation of Built Margin emission factor for each source of baseline generation mix</u>

$$BM_{gr} = \sum \frac{3.6 \otimes P_{n\%} \otimes E_n}{Eff_n}$$ where,

Sl. No.	Symbolic Representation	Illustration
1.	BM_{gr}	Build Margin for base year.(t CO_2/GWh) – (weighted average of emissions from recent capacity additions to the system, which capacity additions defined as the greater (in MWh) of most recent plants constituting to 20 per cent of gross generation or the 5 most recent plants)
2.	E_n	Emission factor (actual) for each fuel type considered
3.	$P_{n\%}$	Share (in %) of power generation by each fuel used, out of power generation from recent capacity additions to the system, which capacity additions defined as the greater (in MWh) of most recent plants constituting to 20 per cent of gross generation or the 5 most recent plants
4.	Eff_n	Efficiency for each fuel type.

<u>Calculation of Combined Margin emission factor</u>

$$CM_{NET} = \frac{(OM_{gr} + BM_{gr})}{2}$$ where

Sl. No.	Symbolic Representation	Illustration
1.	CM_{NET}	Combine Margin Factor
2.	OM_{gr}	OM Emission factor of baseline (tCO_2/GWh)
3.	BM_{gr}	Build Margin for base year.(tCO_2/GWh) - weighted average of emissions from recent capacity additions to the system, which capacity additions defined as the greater (in MWh) of most recent plants constituting to 20 per cent of gross generation or the 5 most recent plants

The assumptions for estimation of CO_2 emissions is as mentioned below.

Operating Margin Calculations: The weighted average emissions of the Rajasthan State Electricity Board Grid (RSEB GRID) generation mix.

- It is assumed that all the hydropower does not lead to emission of methane due to inundation of vegetation.
- The emission factors considered are as per IPCC Guideline

Build Margin Calculations: The weighted average emissions of the recent power-generating stations

- For these calculations, the commissioning dates for the projects under operation are collected and the latest power projects are chosen.

Combined Margin Calculations: Average of the Operating Margin and Build Margin

Step by step calculation of CO_2 emissions due to burning of coal for power generation and emission reductions by project activity is as under.

Baseline Emission Calculations				
Step 1	**:**	Units substituting the grid	=	(Units conserved by the Project activity)
Step 2	**:**	CO_2 Baseline Emissions	=	Units substituting the grid x CM_{NET}

Calculation of CERs

- The phase wise implementation of technological up-gradation and instrumentation during the period of 2000 – 2001, 2001 – 2002 and 2002-2003 are considered under the project.
- Data sheet for equipment performance provides information on motor kWh, Auxiliary kWh, respective kWh / t, mill running hours, cement production [Total] and raw material consumed
- kWh /unit of output is considered the key indicator keeping the property and quality of cement unchanged.

For estimation of CO_2 Reduction for nth year: Following algorithm is followed

Activity	Production	Sp. Energy Consumption reduction during the period	kWh Savings in the nth year	Emission Reduction in nth year
Before project implementation	B	C = 0	K_n =(C1+C2+C3 + ...+ Cn) * B_n	$E_n = K_n * EF_n$
Activity 1(year 1)	B1	C1		
Activity 2 (year 2)	B2	C2		
Activity 3 (year 3)	B3	C3		

EF_n = Baseline Emission factor for the nth year
B_n = Production in nth year
K_n = Net energy savings in the n^{th} year
= (C1 + C2 + C3 + ….+ Cn)*B_n
E_n = Emission reduction in the n^{th} year.

The net emission reduction during the crediting period E = $\sum_{n=1,10} E_n$

Determination of project energy savings:

Unit – CCW

Project Detail CCW	**Saving kWh /T Clinker**	**Clinker (MT)**	**Total Savings (kWh)**
2000-01			
Provision of variable frequency drive in Raw mill vent fan	0.410		
Provision of variable frequency drive in cooler fan 2R	0.078		
Modification of inlet duct of cooler fan V5A	0.048		
2000 – 01 **Total**	**0.536**	**912412**	**489052.832**
2001-02			
Provision of variable frequency drive in cooler fan 2L	0.173		
Provision of variable frequency drive in cooler fan V5A	0.107		
Provision of variable frequency drive in cooler fan V5B	0.044		
2001 – 02 **Total**	**0.324**	**943184**	**811138.24**
2002-03			
Modification of pre heater cyclones, rise duct, down comer, Pre-heater fan, ESP fan & provision of Tertiary crusher of Raw mill	3.410		
Provision of 6 Nos. dip tubes in Raw mill section	0.026		
2002 – 03 **Total**	**3.436**	**1101460.8**	**4731875.597**

Unit – BCW

Project Detail BCW	**Saving kWh /T Clinker**	**Clinker (MT)**	**Total Savings(kWh)**
2001-02			
VFD for Raw Mill No. 1 & 2 vent fans	0.25		
VFD & replacement of Coal Mill No. 1 BDC Fan	0.11		
Bucket Elevators for Kiln feed of Kiln No. 1 & 2	1.24		
2001 – 02 **Total**	**1.60**	**622234**	**995574.4**
2002-03			
Bucket Elevators for raw mill transport from Raw Mill No. 1 & 2 to homosilos	2.35		
VFD & replacement of Coal Mill No. 2 BDC fan	0.21		
Replacement of Cement Mill No. 2 vent fan	0.13		
2002 – 03 **Total**	**2.69**	**631713.6**	**2710051.34**

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

Following formula is used to determine Emission reduction

CO_2 Emission Reduction Calculations		
Baseline Emissions	-	Project Emissions

E.2 Table providing values obtained when applying formulae above:

Following tables indicate the baseline emission factors and emission reductions of each year, for Combined Margin.

Table E.2 – CO_2 emission reductions due to project activity

Year	Estimation of project activity emission reductions (tonnes of CO_2 e)	Estimation of baseline emission reductions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO_2 e)	Estimation of emission reductions (tonnes of CO_2 e)
2001-2002	Nil	445	Nil	445
2002-2003	Nil	1644	Nil	1644
2003-2004	Nil	6772	Nil	6772
2004-2005	Nil	6772	Nil	6772
2005-2006	Nil	6772	Nil	6772
2006-2007	Nil	6772	Nil	6772
2007-2008	Nil	6772	Nil	6772
2008-2009	Nil	6772	Nil	6772
2009-2010	Nil	6772	Nil	6772
2010-2011	Nil	6772	Nil	6772
Total (tonnes of CO_2 e)	**56266**			

SECTION F. Environmental impacts:

F.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

There are no negative environmental impacts from the installation of technologically upgraded energy efficiency equipment and instrumentation work. The technologies are easily transportable and installation does not require any major construction equipment. Only emissions that take place during the whole project execution are the transportation of the implemented machineries and instruments. However considering the life cycle of the project and the beneficial aspects such emissions is negligible.

Summary on Environmental Impact

The project does not have any major environmental impacts nor is the execution of an Environmental Impact Assessment required. However the beneficial aspects of the project are as follows:

The project activity results in

1) Green House Gas Abatement
2) Primary Resource Conservation and facilitating sustainable development
3) Pollution abatement in thermal power plant and its upward linkages.

SECTION G. Stakeholders' comments:

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

The main stakeholders of the project activity are the management representatives who were actively a part of decision-making. The other stakeholders are the employees of the organization who work in the plant and the family members who live in the plant campus. Although such in-house energy efficiency measures adopted by a plant does not demand an elaborate stakeholder consultation process the project proponent has involved its employees at all levels in order to ensure proper understanding of the effects of such initiatives being adopted. The benefits from such activity have also been transparently shared with the supply chain and shareholders.

G.2. Summary of the comments received:

The energy efficiency project does not have any negative impact. The projects also improved the working environment and resulted in better control of operation with reduced hazards. The emission from the captive power plant has also been reduced and local environment has been improved.

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

The relevant comments and important clauses mentioned in the project documents / clearances like Feasibility Report, local clearances *etc.* were considered while preparing the CDM Project Design Document.

As per UNFCCC requirement the PDD will be published at the validator's web site for public comments.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

(Please repeat table as needed)

Organization:	Birla Corporation Limited, Unit- Chittor Cement Works
Street/P.O.Box:	9/1 R. N. Mukherjee Road
Building:	Birla Building
City:	Kolkata
State/Region:	West Bengal
Postcode/ZIP:	Pin – 700 001
Country:	India
Telephone:	+91 – (033) 2213 1680 / 1688 / 1689
FAX:	+91 – (033) 2248 3239
E-Mail:	vspanwar@birlacorp.com
URL:	www.birlacorporation.com/cementframe.html
Represented by:	
Title:	Vice President - Projects
Salutation:	Mr.
Last Name:	Panwar
Middle Name:	S
First Name:	V
Department:	Projects – Birla Corporation Limited
Mobile:	
Direct FAX:	+91 – (033) 2248 3239
Direct tel:	+91 – (033) 2213 1680 / 1688 / 1689
Personal E-Mail:	vspanwar@birlacorp.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Till now funding from any Annex I party is not available.

Enclosure 1 : Abbreviations

BCL	Birla Corporation Limited
BM	Build Margin
BCW	Birla Cement Works
CCW	Chittor Cement Work
CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CER	Certified Emission Reduction
CM	Combined Margin
CO_2	Carbon di Oxide
kgCO_2 equ/kWh	Carbon di Oxide Equivalent per Kilo Watt Hour
ESP	Electro Static Precipitator
GHG	Greenhouse Gases
Hz	Hertz
IPCC	Intergovernmental Panel on Climate Change
kV	Kilo Volt
kW	Kilo Watt
kWh	Kilo Watt Hour
kWh / t	Kilo Watt Hour per Tonne
LDC	Load Dispatch Centre
M & P	Modalities and Procedures
M & V	Monitoring and Verification
MoEF	Ministry of Environment and Forests
RSEB	Rajasthan State Electricity Board
MW	Mega Watt
NHPC	National Hydroelectric Power Corporation
NTPC	National Thermal Power Corporation
OM	Operating Margin
PGCIL	Power Grid Corporation of India Limited
tpd	Tonnes per day
T & D	Transmission and Distribution
tCO_2/TJ	Tonnes of Carbon di Oxide per Trillion Joule
PS	Thermal Power Station
UNFCCC	United Nations Framework Convention on Climate Change

Enclosure 2: List of References

Sl..No.	Particulars of the references
1.	Kyoto Protocol to the United Nations Framework Convention on Climate Change
2.	Website of United Nations Framework Convention on Climate Change (UNFCCC), **http://unfccc.int**
3.	UNFCCC Decision 17/CP.7: Modalities and procedures for a clean development mechanism as defined in article 12 of the Kyoto Protocol.
4.	UNFCCC, Clean Development Mechanism Simplified Project Design Document For Small Scale Project Activities (SSC-PDD) *[Version 01: 21 January, 2003]*
5.	UNFCCC document: Appendix B (contained in Annex-II to decision 21/CP8, see document FCCC/CP/2002/7/Add.3) Indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories [Version 05: 25 February 2005]
6.	http://www.energymanagertraining.com/kaupp/Article25.pdf
7.	http://www.bee-india.com
8.	http://cea.nic.in/

Enclosure 3: Baseline Data

Grid data for calculation of baseline emission factor of grid

Operating margin calculation is based on the data given below:

Table En4.1

Power plants supplying power to Rajasthan grid				
Generation from State owned plants		**Total Capacity (MW)**	**2003-04 M kWh**	**Comments**
1	**Kota TPS**			
	I	220		As per NRLDC 2003-04 report, page 51
	II	420		
	III	210		
	IV	195	6283.81	
2	**Suratgarh TPS**			
	I	500		
	II	500		
	III	250	7524.32	
3	**Ramgarh Gas TPS**			
	I	3	0	
	II	35.5	221.8	
	III	75	0	
4	**Mahi Bajaj Sagar**	140	188.24	
5	**Annopgarh**	9		
6	**Small hydro**	14.85	19.98	
7	**Wind**	--	104.67	
8	**Kalpataru**	7	17.72	

Purchases from central owned plants				
1	**Singrauli TPS**	2000	2622.96	As per the CEA, General Review 2005, Table no. 5.6 and 5.7
2	**Rihand TPS**	1000	918.13	
3	**Unchar TPS**			
	I	420		
	II	420	513.73	
4	**Anta Gas TPS**	413	709.43	
5	**Auriya Gas TPS**	652	456.34	
6	**Dadri Gas TPS**	817	479.26	
7	**Tanakpur hydro**	120	50.7	
8	**Salal hydro**			
	I	345		
	II	345	99.95	
9	**Chamera hydro**			
	I	540		
	II	300	513.12	
10	**Uri**	480	252.7	
11	**RAPP**			
	I	100		
	II	200		
	III	220		
	IV	220	2418.91	
12	**NAPP**	440	348.04	
Purchases from partnership projects				

1	**BBMB**	2876.15	2415.1	
2	**Chambal Projects**			The generation has been taken as per NRLDC 2003-04 report-page 76 and 'firm allocation' is taken as given of page 22 of the same report; Energy Content of G. Sagar : Total energy content at Gandhi Sagar, R. P. Sagar and Jawahar Sagar Power Stations =1480 million kWh.
2.1	**Chambal hydro**			
	Gandhi Sagar	115		
	Rana Pratap Sagar	172		
	Jawahar Sagar	99	740	
2.2	**Satpura TPS**	312.5	314.12	Power purchase from Chambal Projects - Projects 1054.12 MU; Total energy given to Rajasthan from Chambal Projects as given in CEA, General Review 2005, Table no. 5.6 has been considered;
Purchases from Other sources				
	SJVNL	1000	374.43	As per the CEA, General Review 2005, Table no. 5.6 and 5.7
	NTPC (Eastern region)	4910	5.64	
	WBPDC	2910	27.06	
Total			**27620.16**	

Table En4.2: Generation Mix for OM Calculations

Generation mix	**M kWh**
Thermal Coal based(State)	13808.13
Thermal Coal based(Central)	4054.82
Thermal Coal based(Partneship Project)	314.12
Thermal Coal based (other)	27.06 (All the power plants owned by West Bengal Power Development Corporation (WBPDC) are based on coal. Hence this energy supplied to Rajasthan by WBPDCL has been taken as coal based energy generation.)
Gas based (State)	221.8
Gas based (Central)	1645.03
Gas based (other)	5.64 (NTPC operates both coal and gas based plants in India. Due to non-availability of data this energy supplied to Rajastan has been taken as gas based energy generation, to be on conservative side.)
Hydro (State)	208.22
Hydro (Central)	916.47
Hydro (Partnership Project)	3155.1
Hydro (other)	374.43
Nuclear (Central)	2766.95
Renewable -Wind and Biomass	122.39

Build margin calculation is based on the data given below:

Table En4.3: Power Generation Data used for BM calculations				
	M kWh	**MW**		**Comments**
SJVNL				
SJVNL HPS # 1- # 6	6242	1000		1.Total Program generation April,04-March,05 of SJVNL - 6242 mu; Data Source:CEA, Operation Performance Monitoring Division, Energy generation, programs & Plant Load Factor: an overview; 2. Percentage shares of Rajasthan in SJVNL HPS, Central Sector is 7.47%;
Rajasthan's Share	466.2774			
Chamera II				
Chamera II	1400	300		1.Total Program generation April,04-March,05 of Chamera II - 1400 MU; Data Source:CEA, Operation Performance Monitoring Division, Energy generation, programs & Plant Load Factor: an overview; 2. Percentage shares of Rajasthan in Chamera, Central Sector is 9.67%
Rajasthan's Share	135.38			
Kota TPS				
Apr	562.64	850		1. Kota IV was commissioned in July,03; 2.Power Generation Data Source: Annual Grid Report 2003-2004
May	566.67	850		
June	494.63	850		
July	320.84	850		
Aug	463.73	1045	484597.85	
Sep	538.02	1045	562230.9	
Oct	566.37	1045	591856.65	

Nov	607.8	1045	635151	
Dec	595.79	1045	622600.55	
Jan	682.59	1045	713306.55	
Feb	885.94	1045	925807.3	
Mar	671.67	1045	701895.15	
Monthly Weighted Average	626.48875	8360	5237446	
Annual Average Kota TPS	7517.865	1045		
Annual Average Kota IV	1402.85519	195		
Annual Average Kota I,II,III	6115.00981	850		
Suratgarh				
Apr	519.65	1000	519650	1. Suratgarh III was commissioned in June,03;2.Power Generation Data Source: Annual Grid Report 2003-2004;
May	621	1000	621000	
June	507.23	1250	634037.5	
July	383.07	1250	478837.5	
Aug	619.79	1250	774737.5	
Sep	656.5	1250	820625	
Oct	792.82	1250	991025	
Nov	809.2	1250	1011500	
Dec	845.76	1250	1057200	
Jan	888.52	1250	1110650	
Feb	772.65	1250	965812.5	
Mar	886.91	1250	1108637.5	
Monthly Weighted Average	716.245	12500	8953062.5	
Annual Average Suratgarh	8594.94			
Annual Average Suratgarh III	1718.988			
Annual Average Suratgarh II	3437.976			
Annual Average Suratgarh I	3437.976			

Table En4.4 Generation Mix for BM calculations

List of plants supplying power to Rajasthan state grid arranged in descending order of date of commissioning					
Total Power Generation				27602.44	
20% of the existing plants				5520.488	
	Plant	**Capacity**	**Commissioning**	**Annual Generation (M kWh)**	**Comments**
1	SJVNL (Naptha Jhakri)	1000	Mar-04	466.2774	
2	Chamera-II	300	Feb-04	135.38	
3	Kalpataru		Sep-03	17.72	Note: Kalpataru plant has been excluded from build margin calculations since the project has been submitted for CDM project Validation[8]
4	Kota TPS-IV	195	Jul-03	1402.855191	Refer to Table B 3.4
5	Suratgarh-III	250	Jun-03	1718.988	Refer to Table B 3.4
6	Wind Farm	120.9	103.35 MW commissioned between 2002-03; 17.55MW commissioned between 2003-2004	104.67	Refer to Table B 3.5
			5 most recent plants	**3828.170591**	
7	Suratgarh-II	500	Mar-02	3437.976	
			20% of the existing plants	**7266.146591**	
			Coal	6559.819191	
			Gas	0	
			Hydro	601.6574	
			Wind	104.67	
			Nuclear	0	

[8] Reference has been taken from ACM0002/Version 01, Sectoral Scope: 1, 3 September 2004, page 8.

Table En4.5

Status of Proposal Registered for Wind Power Project in Rajasthan as on 20.9.2004							
Date of application submission	**Developer**	**Village**	**Land Area in hectare**	**Proposed capacity MW**	**No. & date of recommendation of land to Collector, Jaisalmer**	**Status of allotment of land**	**Commissioning schedule**
20.11.2002	Suzlon Energy Ltd.	Baramsar	92.54	10.6	7466-70/ 23.11.02	Allotted	Commissioned
21.12.2002	Suzlon Energy Ltd.	Soda /	62.33	25	i) 8993-96 / 8.1.03	Allotted	Commissioned
24.12.2002	Enercon Wind Farms (Jaisalmer) Pvt. Ltd.	Soda/	19	24	11181-86 / 3.3.03	Allotted	Commissioned
21.1.2003	RSMML II Phase Udaipur	Pohara	43.62 Phase-III	10	10100-105 / 13.2.2003	Allotted	5 MW Commissioned
20.2.2003	Enercon India Ltd.	Gorera/	140	25	11176-80 / 3.3.03	Allotted	Commissioned
25.3.2003	Suzlon Energy Ltd	Soda /	52.69	15	3507-3511 / 26.6.03	Allotted	6.25 MW commissioned
26.3.2003	Suzlon Energy Ltd	Phoara	88.8	10	3512-16/ 20.6.03	Allotted	7.50 MW Commissioend
19.5.03	Suzlon Energy Ltd.	Baramsar	49.72	8.75	2719-2723 / 4.6.03	Allotted	5.25 MW commissioned
19.8.2003	Enercon	Soda/	51	10	6630-35 /1.9.03	Allotted	Commissioned
12.1.2004	Enercon Wind Farms (Jaisalmer) Pvt. Ltd.	Soda	32	10		Allotted	2.3 MW Commissioned
Total				**120.9**			

Emission factors

The mission factors are based on IPCC Guidelines for National Greenhouse Gas Inventories and are given below.

Fuel	Emission factor[9] (tC/TJ)	Emission factor (tCO_2/TJ)
Natural gas	15.3	56.1
Sub-bituminous coal	26.2	96.1

[9] Page 1.13, Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual