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

"Energy Efficiency Improvement in a Cement Plant"

India:
Jaypee Associates (Cement), Madhya Pradesh

Submitted by

Emergent Ventures India Pvt Ltd

II C 141, Ridgewood Estate DLF-IV
Gurgaon, Haryana

AUG 04

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

>>

Energy Efficiency Improvement in a Cement Plant

At Jaypee Associates (Cement), Madhya Pradesh, India

A.2. Description of the project activity:

>>

The Project proposes to improve the thermal energy consumption as well as electrical energy consumption through a variety of process improvements in two plants of Jaypee Cement, India.

Key process changes being implemented are:

- Increasing the number of pre-heaters from 4 to 6, thus increasing recovery of thermal energy.
- Improving the kiln burner, insulation and operating speeds, which will increase throughput and reduce the thermal energy consumption.
- Improving grinding of raw meal, coal mill, cement mill etc through installation of modern mills.
- Improving the technology of cooling of clinker to improve thermal energy consumption.
- Use of high efficiency classifiers in various grinding operations.
- Use of mechanical conveying (bucket elevators) in place of pneumatic conveying
- Use of increased dry ash; up-gradation of ash handling system.

The additional clinker produced from the system (~1.0 million T) would be fed to a new plant (at Tanda, Uttar Pradesh) where clinker would be ground and mixed with fly-ash to create PPC/blended cement.

The proposed changes are not common practice in India. Less than 15 plants out of 127 plants in India would have the various technology elements involved. Normally companies don't undertake such large investments for energy efficiency.

The total investment in this project is Rs 1270 millon ~ $28 million (excluding the new grinding unit at Tanda). This investment is very high, specially when looked at in light of stretched financial leverage of the Project Proponent (D:E ratio 1.78- 2003-04) and losses made by the Project Proponent in recent past (1997-2001).

Jaipraksh Associates Ltd.	Mar 1997	Mar 1998	Mar 1999	Sep 2000	Mar 2002	Mar 2003	Mar 2004
	5 mths	12 mths	12 mths	18 mths	18 mths	12 mths	12 mths
PAT (NNRT)	-145.54	-45.08	-12.14	-20.5	6.45	4.58	2.57

However the Project Proponent is committed to environment, social contribution and energy conservation.

The Project Proponent has decided to invest in the Project activity, after accounting for the benefits available under Clean Development Mechanism. The same has been recorded in various official documents, where the proposed project was approved.

A.3. Project participants:

>>

The Project Participants are:

Jaypee Associates Ltd (JPA)	This is Porject Activity Host Company. It is a company of Jaypee group, India and has one of the largest single location capacities in Madhya Pradesh, which serves the states of Madhya Pradesh, Uttar Pradesh, New Delhi and Bihar. The investment in the project is being made by this company
Emergent Ventures India Pvt Ltd (EVI)	EVI is the Project Developer for CDM project development and marketing of emission reductions.

The 'party involved' in the project activity is India (the host country). Both project participants are from India.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

>>

The project is composed of changes in 2 plants of JPA located in Rewa district of Madhya Pradesh. The plants are at a distance of 6 KM from each other. The plants are known as Rewa Plant and Bela plant.

A.4.1.1. Host Party(ies):

>>

India

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

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Madhya Pradesh, Rewa District (Rewa Plant), Satna District (Bela plant); both districts are adjoining

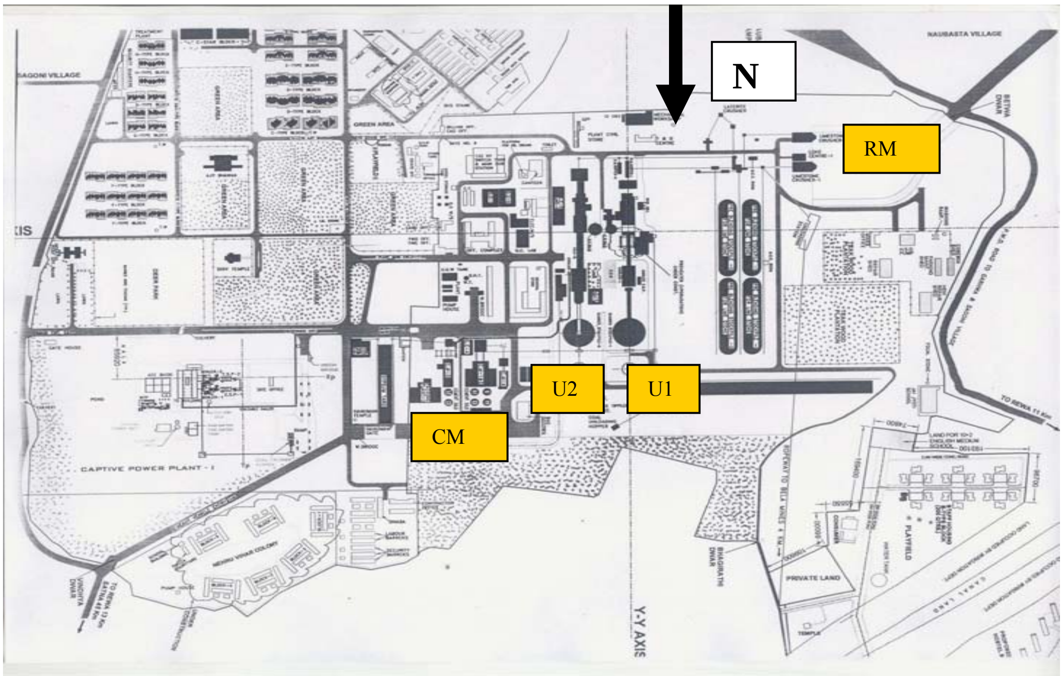
A.4.1.3. City/Town/Community etc:

>>

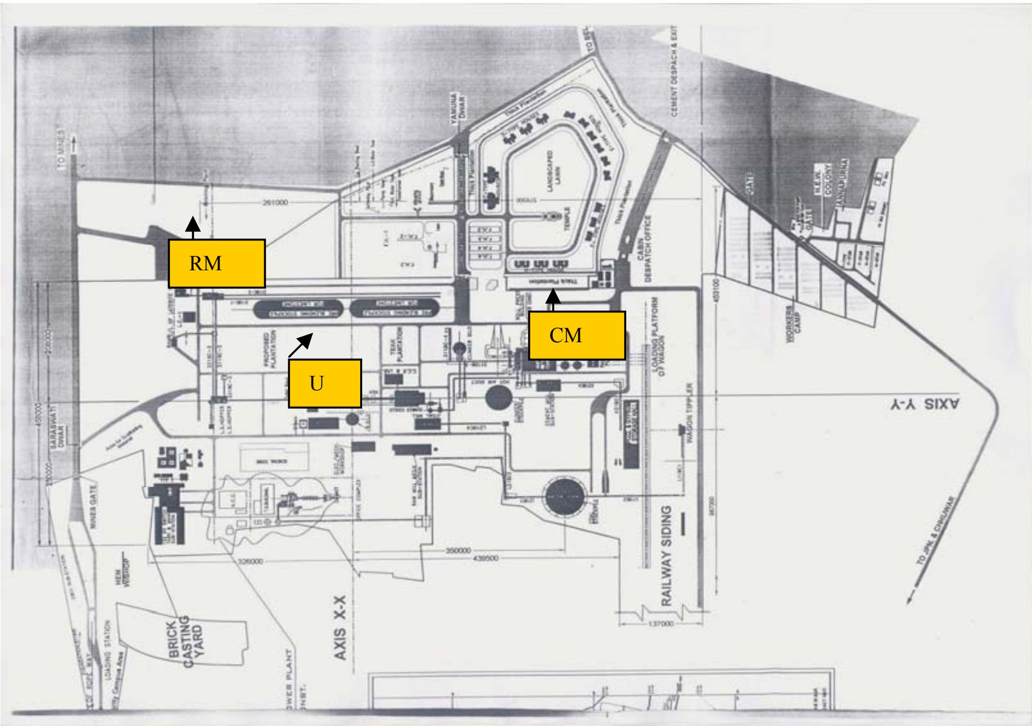
Rewa City

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

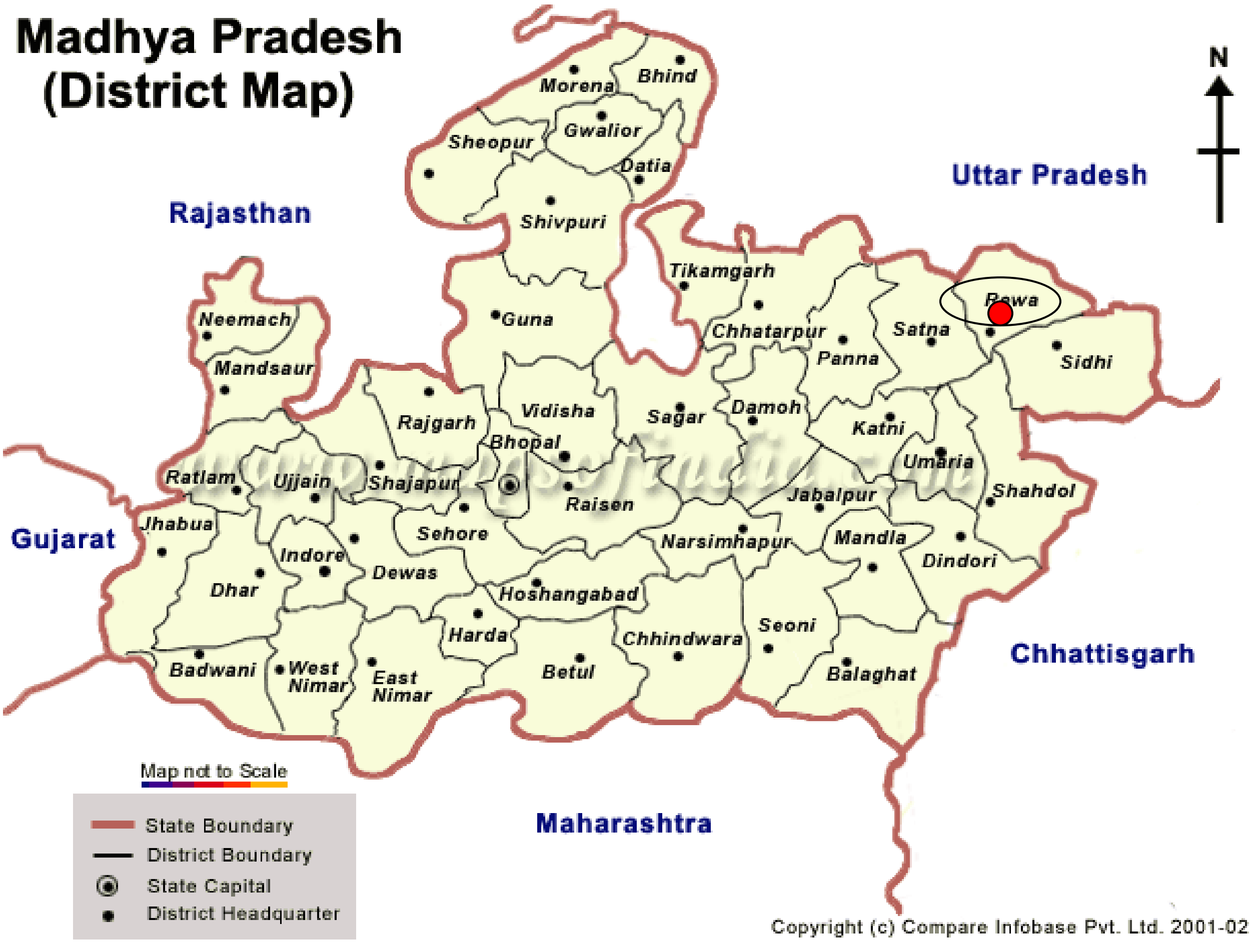
>>



<u>Rewa Plant of JPA</u> CM= Cement Mill, U2/U1= Kilns, RM= Raw Mill



<u>Bela Plant of JPA</u>: U= Kiln, CM = Cement Mill, RM = Raw Mill


Madhya Pradesh
(District Map)
Rajasthan
Uttar Pradesh
Gujarat
Chhattisgarh
Maharashtra
N
Morena
Bhind
Gwalior
Sheopur
Datia
Shivpuri
Tikamgarh
Guna
Neemach
Mandsaur
Chhatarpur
Panna
Satna
Rewa
Sidhi
Rajgarh
Vidisha
Sagar
Damoh
Katni
Bhopal
Umaria
Ratlam
Ujjain
Shajapur
Raisen
Jabalpur
Shahdol
Jhabua
Sehore
Narsimhapur
Mandla
Indore
Dindori
Dewas
Dhar
Hoshangabad
Harda
Seoni
Chhindwara
Badwani
West Nimar
East Nimar
Betul
Balaghat
Map not to Scale
State Boundary
District Boundary
State Capital
District Headquarter
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A.4.2. Category(ies) of project activity:

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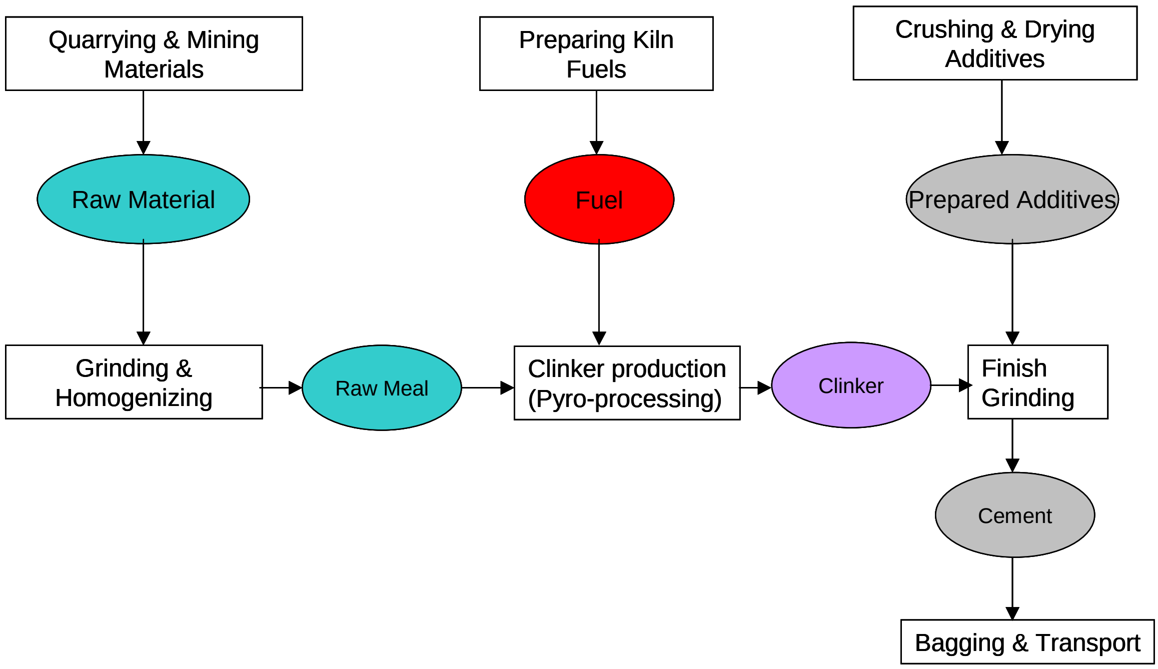
The project activity falls under Sectoral scope 3 – Energy Demand.

The project is 'Energy Efficiency Improvement' for manufacturing of cement.

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

>>
The process flow for production of cement is as follows:



The project activity would implement the following key changes:

- Increasing the number of pre-heaters from 4 to 6, thus increasing recovery of thermal energy.
- Improving the kiln burner, insulation and operating speeds, which will increase throughput and reduce the thermal energy consumption.
- Improving grinding of raw meal, coal mill, cement mill etc through installation of modern roller presses/mills.
- Improving the technology of cooling of clinker to improve thermal energy consumption.
- Use of high efficiency classifiers in various grinding operations.
- Use of mechanical conveying (bucket elevators) in place of pneumatic conveying
- Use of increased dry ash; up-gradation of ash handling system.

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 reduction of Co2 takes place because:

- Electrical energy consumption improves resulting in lesser fuel requirement for internal electrical power generation and therefore lesser Co2 emission; this also means lesser (proportionately) sourcing of power from grid, which also reduces power generation and fuel consumption in the overall system, resulting in reduction of Co2 emission.
- Thermal energy consumption improves resulting in lesser fuel requirement for thermal power generation.
- The project also produces more (throughput increase); thus improved energy consumption applies to larger production, resulting in additional emission reduction.

The baseline emission for the project is estimated based on historical emission levels prior to project implementation.

The emission reduction over and above the baseline wouldn't have happened in absence of project activity, as such large scale improvements require large investments and the financial attractiveness of the proposed projects is low.

There are no sectoral policies mandating improvements in energy consumption.

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

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Estimated reduction in tCo2 : **1,084,469**

A.4.5. Public funding of the project activity:

>>

No public funding envisaged

SECTION B. Application of a baseline methodology

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

>>

There are no approved methodologies for energy efficiency improvements. A new baseline methodology titled '**Energy Efficiency Improvement in Process and Manufacturing Industries'** is proposed and has been used for estimation of emission reduction.

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

>>

The methodology covers a range of process improvements in manufacturing sector which result in improvements in parameters such as:

a) (Specific) electrical energy consumption per unit of production
b) (Specific) thermal energy consumption per unit of production
c) de-bottlenecking of plant capacities accompanied with improvements in specific energy consumptions
d) efficiency of generation of electrical power
e) efficiency of consumption of thermal energy
f) change in ratio of electrical power sourced from grid

The current Project involves improvements in first 3 parameters mentioned above. These improvements are achieved by implementing a number of small process improvements throughout the key plant systems such as raw mill, cement mill and kilns (pre-heater, coal mill, burners, insulation, cooler etc).

The methodology is based on historical emissions achieved by the plants and additionality arguments are based on financial analysis as well as barriers to the project.

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

>>

The methodology is applied to the Project Activity as follows:

Possible Scenarios:

- Continuing as is- historical performance of the plant
- Project Activity

The first scenario is proposed as baseline. Project Activity results in reduction of energy consumption/ton of production and therefore leads to reduction of fuel consumption and related emissions.

- Step1: Baseline Estimation
- Step2: Estimation of emissions post implementation of Project Activity and improvement expected
- Step3: Year wise estimation of Emission Reduction
- Step 4: Analysis of Additionality of Project Activity

Step 1: Baseline establishment

Estimation of specific energy consumptions and other parameters

Emission Model

Parameter	UOM	Rewa Plant	Bela Plant
Total Production		**2,680,575**	**1,959,003**
tsE (Specific thermal consumption_corrected for product mix)	KJ/T of cement	2380074	2371972
esE (Specific energy consumption_corrected for product mix)	KWHr/T of cement	95.31	91.71
rE (Fraction of energy generated in-house)		0.614	0.613
eEffy (electrcial generation efficiency	%	29.9%	38.3%
eCF (carbon factor for fuels used for electrical power generation)	Kg of C/Kg of fuel	68%	86.6%
EF (emission factor for the grid)	Kg of Co2/KWhr of power generated	0.91	0.91
TD (transmission and distribution losses)	%	34.60%	34.60%
tCF (carbon factor for fuels used in thermal energy generation)	Kg of C/Kg of fuel	54%	54%
teffy - efficiency of thermal energy consumption	%	1.00	1.00
eCV (calorific value of fuels used for electrical power generation)	KJ/Kg	31407	43960
tCV (calorific value of fuels used for thermal energy generation)	KJ/Kg	20581	20581
TEF	**Kg of C02/T of cement**	**335.7**	**315.3**

TEF = Total emission factor (excluding process emissions in calcinations)

The baseline scenario would therefore be:

Emissions in T of C02

2004-05									
1	2	3	4	5	6	7	8	9	10
1,854,357	1,854,357	1,854,357	1,854,357	1,854,357	1,854,357	1,854,357	1,854,357	1,854,357	1,854,357

- **Step 2: Estimation of emissions post implementation of Project Activity and improvement expected**

Emission Model				
Parameter	UOM	Rewa Plant		
		Current	Post Project	Improvement
Clinker for supply	T	266,834	967226	700392
Cement for supply	T	2,413,741	2413741	0
Total Production		2,680,575	3,380,967	700,392
Clinker to cement ratio	T/T of cement	79.0%	79.0%	0.0%
tsE (Specific thermal consumption _corrected for product mix)	KJ/T of cement	2380074	2226688	153386
esE (Specific energy consumption corrected for product mix)	KWHr/T of cement	95.31	88.00	7.32
rE (Fraction of energy generated in-house)		0.614	0.614	0.000
eEffy (electrcial generation efficiency	%	29.9%	29.9%	0.000
eCF (carbon factor for fuels used for electrical power generation)	Kg of C/Kg of fuel	68%	68%	0.000
EF (emission factor for the grid)	Kg of Co2/KWhr of power generated	0.91	0.91	0.000
TD (transmission and distribution losses)	%	34.60%	34.60%	0.000
tCF (carbon factor for fuels used in thermal energy generation)	Kg of C/Kg of fuel	54%	54%	0.000
teffy - efficiency of thermal energy consumption	%	1.00	1.00	0.000
eCV (calorific value of fuels used for electrical power generation)	KJ/Kg	31407	31407	0.000
tCV (calorific value of fuels used for thermal energy generation)	KJ/Kg	20581	20581	0.000
TEF	**Kg of C02/T of cem**	**335.7**	**312.7**	**23.0**

Emission Model				
Parameter	UOM	Bela Plant		
		Current	Post Project	Improvemen
Clinker for supply	T	121,198	451198	330000
Cement for supply	T	1,837,805	1837805	0
Total Production		1,959,003	2,289,003	330,000
Clinker to cement ratio	T/T of cement	83.0%	83.0%	0.0%
tsE (Specific thermal consumption _corrected for product mix)	KJ/T of cement	2371972	2269914	102058
esE (Specific energy consumption corrected for product mix)	KWHr/T of cement	91.71	86.88	4.83
rE (Fraction of energy generated in-house)		0.613	0.613	0.000
eEffy (electrcial generation efficiency	%	38.3%	38.3%	0.000
eCF (carbon factor for fuels used for electrical power generation)	Kg of C/Kg of fuel	86.6%	87%	0.000
EF (emission factor for the grid)	Kg of Co2/KWhr of power generated	0.91	0.91	0.000
TD (transmission and distribution losses)	%	34.60%	34.60%	0.000
tCF (carbon factor for fuels used in thermal energy generation)	Kg of C/Kg of fuel	54%	54%	0.000
teffy - efficiency of thermal energy consumption	%	1.00	1.00	0.000
eCV (calorific value of fuels used for electrical power generation)	KJ/Kg	43960	43960	0.000
tCV (calorific value of fuels used for thermal energy generation)	KJ/Kg	20581	20581	0.000
TEF	**Kg of C02/T of cem**	**315.3**	**300.8**	**14.4**

Overall reduction in emission expected

TEF0 (overall)		**327.0**	**307.9**	**19.1**
Total ER	**T of Co2**			**108447**

Step 3: Year wise estimation of Emission Reduction

With this analysis of Post Project improvement and the baseline, the year wise emission reduction is estimated to be as follows

2004-05 1	2	3	4	5	6	7	8	9	10
108,447	108,447	108,447	108,447	108,447	108,447	108,447	108,447	108,447	108,447

Step 4: Analysis of Project Additionality

Test1: Qualification

The project qualifies this test as

- It reduces emissions below the historical baseline
- It is not mandated by law
- The credit period is not expected to start before submission for registration.

Test2: Financial Analysis

The financial analysis of the Project is given in enclosed excel spreadsheet. This has been carried out in accordance with the proposed baseline methodology.

The Net Present Value of the project (at the Weighted Average Cost of Capital or WACC) is a negative Rs. 156 million (approx. 12% of the investment). The project IRR, at ~ 9.77 % is less that the WACC of 12.4%.

Sensitivity analysis shows that only if EBIDTA margin on sales improves to 16% (compared to last 5 yrs average of 12.4%), does the IRR cross the cost of capital. However 16% EBIDTA margin has been crossed only once in last 5 yrs and thus cannot be taken as a high probability for average EBIDTA margins in the future.

This project needs additional revenue support in the region of ~ Rs 156 million (NPV terms). Revenue from the sale of CERs enable the project developer to generate the additional revenue to support the project and improve the project IRR to 12.97% and thus make it eligible for consideration / implementation.

Test3: Barrier Analysis

- Investment barrier – although less common, but such projects are funded by banks for competitive players in India. Hence not a significant barrier.
- Technology barrier – the technologies involved are available from well know suppliers, and although less commonly used, competent manufacturers are able to arrange such technologies.
- Prevailing practice barrier – there is a large growth in Indian economy and cement demand is rapidly growing. Hence project Developers are reluctant to invest large sums in such projects. They normally would like to invest in expansion of capacities. This barrier can be significant for energy efficiency projects.

Test 4: Common practice
Technologies such as 6 stage preheating, supersonic burners are very investment intensive and only large players are able to afford them. Of 127 large cement plants in India (2004)[1], as per our discussions with technology suppliers and equipment vendors less than 15 plants in India would be using technologies such as 6 stage pre-heaters[2], modern Duo-flex burners[3], high efficiency classifiers[4], installation of static inlet (IKN) etc.

The Project Activity of this scale is therefore rare, and using so many new technologies for modifying an existing plant in India is NOT COMMON.

Moreover the unique factor relating to the Project Proponent is that it is financially stretched –
- it has made losses in 4 out of last 7 years

Jaiprakash Associates Ltd.	Mar 1997	Mar 1998	Mar 1999	Sep 2000	Mar 2002	Mar 2003	Mar 2004
	5 mths	12 mths	12 mths	18 mths	18 mths	12 mths	12 mths
PAT (NNRT)	-145.54	-45.08	-12.14	-20.5	6.45	4.58	2.57

- and it has high debt equity ratio of 1.78 (march 2004).

The Project Proponent has invested in this project only after justifying the viability of the project based on benefits from Carbon Credits and its continued drive to be environmentally positive.

Summary

Since the project is financially not attractive and wouldn't have been undertaken by the Project Proponent without the support of Carbon Credits especially in view of its financially stretched condition, and the technologies involved not being common, it qualifies the Additionality Test.

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[1] Cement Statistics 2004, produced by Cement Manufacturers Association, India

[2] Technology introduced in India in 1992, and only new plants after 1992 may have this expensive technology; very few older plants have shifted to this technology because of massive investments and production interruption involved. Total plants using this technology in India may be <15.

[3] These burners are supersonic burners and this technology was introduced in India in 1997. According to experts only 7-8 plants are using this technology in India.

[4] This technology was introduced in 1999-2000 in India and 8-10 plants may have adopted this in India.

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:

>>

Reduction of energy consumed results in less fuel burnt and therefore results in reduction of Co2 emissions.

Despite the fact that the improvements also reduce the emission of other 'Kyoto gases' such as methane or nitrous oxide, as well as reduces the emissions associated to fuel mining and transportation as fuel consumption comes down, the same have been ignored in order to make the assumptions as conservative as possible.

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

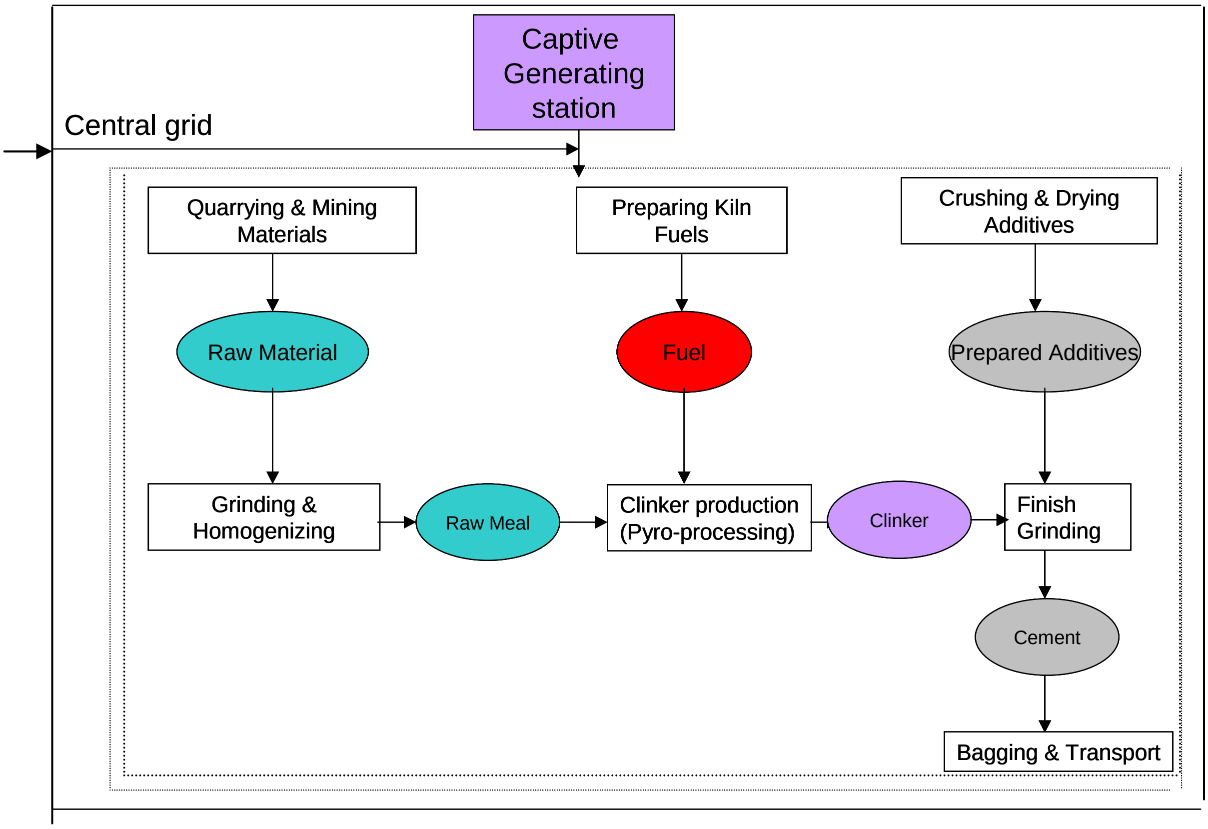
>>

The methodology defines the boundary as:

- Whole of manufacturing unit where Project is going to be implemented (including all buildings, plants and equipment and local raw material sources if they are owned by the business and can be made part of one geographical boundary).
- Connection to electricity supply grid, indirect regional grid (central grid of India)

The methodology analyzes the entire plant as a system and also incorporates the impact on (increased/decreased) import of electricity from the grid on emission.

The same approach has been used here.



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:

>>

Baseline study was completed on 15th of August 2004, based on energy records of the two plants. The estimation was done by (Vinod Kala) EVI, a Project Participant with details as enclosed in the annexure-1

The baseline information is enclosed in the spreadsheet JP Energy Effy Jan05.xls, as well as Annex-3

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:

>>

Mar 04

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

>>

The operational life time would be 20 yrs, as for most of industrial plant and equipment.

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:

>>

C.2.1.2. Length of the first crediting period:

>>

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

1st April 05

C.2.2.2. Length:

>>

10 yrs

SECTION D. Application of a monitoring methodology and plan

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

>>

There is no approved methodology for monitoring for the Project Activity. A new monitoring methodology titled '**Energy Efficiency Improvement in Process and Manufacturing Industries'** is proposed.

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

>>

The methodology is designed for monitoring system level improvements in a manufacturing industry, for the following parameters:

- (Specific) electrical energy consumption per unit of production
- (Specific) thermal energy consumption per unit of production
- de-bottlenecking of plant capacities accompanied with improvements in specific energy consumptions
- efficiency of generation of electrical power
- efficiency of consumption of thermal energy
- change in ratio of electrical power sourced from grid

The current Project involves improvements in first 3 parameters mentioned above.

The methodology is therefore able to cover these improvements.

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
A 01-01-01	*Qcl (rewa)- Quantity of clinker exported/supplied from Rewa Plant*	*Production records*	*Tons*[5]	*m*	*monthly*	*100%*	*Electronic*	
A01-01-02	*Qcl(Bela)- quantity of clinker exported/supplied from Bela Plant*	*Production records*	*Tons*	*m*	*monthly*	*100%*	*electronic*	
A01-02-01	*Qc- Quantity of total cement produced in Rewa Plant*	*Production records*	*Tons*	*m*	*monthly*	*100%*	*electronic*	
A01-02-02	*Qc- Quantity of total cement produced in Bela Plant*	*Production records*	*Tons*	*m*	*monthly*	*100%*	*electronic*	
A01-03-01	*Qcl© - quantity of clinker consumed within*	*Production records*	*Tons*	*m*	*monthly*	*100%*	*electronic*	

[5] Could be Litres, Nos, or other relevant units as well, depending on the nature of Industry.

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
	the plant at Rewa							
A01-03-02	*Qcl© - quantity of clinker consumed within the plant at Bela*	*Production records*	*Tons*	*m*	*monthly*	*100%*	*electronic*	
A01-03-01	*R (ratio of clinker: cement) in the cement produced at Rewa Plant*	*Production records*	*(no)*	*e*	*monthly*	*Once a month*	*electronic*	*This is calculated as total clinker consumed within the plant divided by total cement produced within the plant.* *This ratio would be used to make product-mix factor adjustments, as outlined in the methodology*
A01-03-02	*R (ratio of clinker: cement) in the cement produced at Bela Plant*	*Production records*	*(no)*	*e*	*monthly*	*Once a month*	*electronic*	-do-
A 02-01	*EG- electricity generated in the plant at Rewa*	*Record of generating stations – energy meter*	*KWHrs*	*m*	*monthly*	*100%*	*Electronic*	
A 02-02	*EG- electricity generated in the plant at Bela*	*Record of generating stations – energy meter*	*KWHrs*	*m*	*monthly*	*100%*	*Electronic*	

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
A 03 (01….k[6])-01	*eQ – quantity of fuel(s) consumed for generation of electricity, at Rewa*	*Records of generating station*	*Kgs*	*m*	*monthly*	*100%*	*Electronic*	*This has to be measured for each fuel such as Fuel Oil, Diesel, Coal etc; these quantise would be used to calculate wtd average calorific value and carbon factors for the consumed fuels.*
A 03 (01….k[7])-02	*eQ – quantity of fuel(s) consumed for generation of electricity, at Bela*	*Records of generating station*	*Kgs*	*m*	*monthly*	*100%*	*Electronic*	*-do*
A 04(01….k)-01	*eCV- calorific value of fuels (HCV) consumed for generation of electricity at Rewa*	*Laboratory records or certificates of supplier*	*KJ/Kg*	*C*	*monthly*	*100% of the lots(same supply source, same lot) consumed*	*Electronic*	*Calculation of this value is simple average of monthly samples for each lot, undertaken by the labs or wtd average of supplier certified calorific values wtd with qty consumed during the month.*
A 04(01….k)-01	*eCV- calorific value of fuels (HCV) consumed for generation of electricity at Bela*	*Laboratory records or certificates of supplier*	*KJ/Kg*	*C*	*monthly*	*100% of the lots(same supply source, same lot) consumed*	*Electronic*	*-do*

[6] The numbers in brackets identify different fuels used by the Plant

[7] The numbers in brackets identify different fuels used by the Plant

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
A 05 (01….k)-01	*tQ – quantity of fuel(s) consumed for generation of thermal energy at Rewa*	*Records of generating station/ Consuming process*	*Kgs*	*m*	*monthly*	*100%*	*Electronic*	*The effect of bio-mass use is not accounted for as the bio-mass switch is a separate project idea. If any bio-mass is used, it is converted back into eq coal quantity for same calorific value.*
A 05 (01….k)-02	*tQ – quantity of fuel(s) consumed for generation of thermal energy at Bela*	*Records of generating station/ Consuming process*	*Kgs*	*m*	*monthly*	*100%*	*Electronic*	*-do*
A 06 (01….k)-01	*tCV- calorific value of fuels (HCV) consumed for generation of thermal energy at Rewa*	*Laboratory records or certificates of supplier*	*KJ/Kg*	*C*	*monthly*	*100%*	*Electronic*	*Calculation of this value is by wtd average value of fuel lots received and consumed (as per FIFO accounting method; wtd with weight consumed)*
A 06 (01….k)-02	*tCV- calorific value of fuels (HCV) consumed for generation of thermal energy at Bela*	*Laboratory records or certificates of supplier*	*KJ/Kg*	*C*	*monthly*	*100%*	*Electronic*	*-Do-*
A 07 -01	*eEP-purchased electrical energy from the grid at Rewa*	*Electricity Meter for the Project Boundary*	*KWHr*	*m*	*monthly*	*100%*	*Electronic*	*Can be negative if the plant has been net exporter of the energy*
A07-02	*eEP-purchased electrical energy from the grid at*	*Electricity Meter for the Project*	*KWHr*	*m*	*monthly*	*100%*	*Electronic*	*Can be negative if the plant has been net exporter of the energy*

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
	Bela	*Boundary*						
A 8	*EF- emission factor of the grid*	*Published statistics by National Electricity Authority or other such body*	*kg of Co2/KWHr generated*	*e*	*Annual*	--	*Electronic*	*Based on TERI published data for Central grid in India- average emission factor*
A 9	*TD- transmission and distribution losses*	*Published statistics by National Electricity Authority or other such body*	*%*	*e*	*Annual*	--	*Electronic*	*Based on Central Electricity Authority Estimates for such losses/TERI data*

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

>>

For benchmark setting post project implementation, data pertaining to 30 days after implementation would be used (estimated for maximum capacity production)

$\mathbf{Q_T}$ = quantity of production (of the main product) by the plant – capacity production = 5,669,969 T

$\mathbf{reE_T}$ = ratio of generated electrical power to consumed electrical power = 61.39%

$\mathbf{esE_T}$ = specific electrical energy consumption KWHr /unit of production = 87.5

tsE_T	=	specific thermal energy consumption KJ/unit of production	=	2,244,139
K	=	conversion factor for converting KWHr to KJ (KJ/KWHr)	=	3600
$teffy_T$	=	efficiency of consumption of thermal energy within the plant –1 in cases where energy is directly consumed in a process (such as coal feed to a kiln in a Cement plant)	=	1.0

$eeffy_T$ = efficiency of generation of electrical energy within the plant = 35.64%

= total electrical energy produced in the plant (KWhr)●K//(Calorific value of fuel burned for electrical energy generation eCV_T x fuel quantity eQ_T)

$eFEF_T$ = emission factor for fuel mix used for in-house electrical power generation = 2.06 X 10^(-6)

= $eFEF_0$ (the value for the fuel mix prior to project as fuel mix change is not part of the analysis).

$tFEF_T$ = emission factor for fuel mix used for thermal power generation = 2.62 X 10^(-6)

= $tFEF_0$ (the value for the fuel mix prior to project as fuel mix change is not part of the analysis).

EF_T = Emission factor of the grid (Kgs of Carbon di-oxide emission /KWHr of power generated) = 0.91

= will be same as EF_0 (as the project doesn't impact change of grid)

TD_T = average transmission and distribution losses for grid power = 34.6%

= will be same as TD_0 (as the project doesn't impact change of grid)

Hence

$TEF_{T,0}$ = emission factor of specific energy consumed post project implementation

$$= (esE_T \bullet ((1-reE_T) \bullet EF_0 / (1-TD_0) + reE_T / eeffy_T \bullet eFEF_0 \bullet K) + tsE_T / teffy_T\ tFEF_0)$$ = 307.9 Kg of C02/T of cement

Adjustment for Product Mix Changes

Product mix changes substantially post project and product mix has a substantial impact on energy consumption. The specific electrical energy consumption and specific thermal energy consumptions have been adjusted using product mix prior to project implementation.

I = as measured prior to Project Implementation; A = as measured at the time of validation of CERs

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
I 01-01-01	*Qcl (rewa)- Quantity of clinker exported/supplied from Rewa Plant*	*Production records*	*Tons*[8]	*m*	*monthly*	*100%*	*Electronic*	
I 01-01-02	*Qcl(Bela)- quantity of clinker exported/supplied from Bela Plant*	*Production records*	*Tons*	*m*	*monthly*	*100%*	*electronic*	
I01-02-01	*Qc- Quantity of total cement produced in Rewa Plant*	*Production records*	*Tons*	*m*	*monthly*	*100%*	*electronic*	
I01-02-02	*Qc- Quantity of total cement produced in Bela Plant*	*Production records*	*Tons*	*m*	*monthly*	*100%*	*electronic*	
I01-03-01	*Qcl© - quantity of clinker*	*Production records*	*Tons*	*m*	*monthly*	*100%*	*electronic*	

[8] Could be Litres, Nos, or other relevant units as well, depending on the nature of Industry.

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
	consumed within the plant at Rewa							
I01-03-02	*Qcl© - quantity of clinker consumed within the plant at Bela*	*Production records*	*Tons*	*m*	*monthly*	*100%*	*electronic*	
I01-03-01	*R (ratio of clinker: cement) in the cement produced at Rewa Plant*	*Production records*	*(no)*	*e*	*monthly*	*Once a month*	*electronic*	*This is calculated as total clinker consumed within the plant divided by total cement produced within the plant.* *This ratio would be used to make product-mix factor adjustments, as outlined in the methodology*
I01-03-02	*R (ratio of clinker: cement) in the cement produced at Bela Plant*	*Production records*	*(no)*	*e*	*monthly*	*Once a month*	*electronic*	-do-
I 02-01	*EG- electricity generated in the plant at Rewa*	*Record of generating stations – energy meter*	*KWHrs*	*m*	*monthly*	*100%*	*Electronic*	
I 02-02	*EG- electricity generated in the plant at Bela*	*Record of generating stations – energy*	*KWHrs*	*m*	*monthly*	*100%*	*Electronic*	

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
		meter						
I 03 (01….k[9])-01	*eQ – quantity of fuel(s) consumed for generation of electricity, at Rewa*	*Records of generating station*	*Kgs*	*m*	*monthly*	*100%*	*Electronic*	*This has to be measured for each fuel such as Fuel Oil, Diesel, Coal etc; these quantise would be used to calculate wtd average calorific value and carbon factors for the consumed fuels.*
I 03 (01….k[10])-02	*eQ – quantity of fuel(s) consumed for generation of electricity, at Bela*	*Records of generating station*	*Kgs*	*m*	*monthly*	*100%*	*Electronic*	*-do*
I 04(01….k)-01	*eCV- calorific value of fuels (HCV) consumed for generation of electricity at Rewa*	*Laboratory records or certificates of supplier*	*KJ/Kg*	*C*	*monthly*	*100% of the lots(same supply source, same lot) consumed*	*Electronic*	*Calculation of this value is simple average of monthly samples for each lot, undertaken by the labs or wtd average of supplier certified calorific values wtd with qty consumed during the month.*
I 04(01….k)-01	*eCV- calorific value of fuels (HCV) consumed for generation of electricity at Bela*	*Laboratory records or certificates of supplier*	*KJ/Kg*	*C*	*monthly*	*100% of the lots(same supply source,*	*Electronic*	*-do*

[9] The numbers in brackets identify different fuels used by the Plant

[10] The numbers in brackets identify different fuels used by the Plant

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
						same lot) consumed		
I 05 (01….k)-01	*tQ – quantity of fuel(s) consumed for generation of thermal energy at Rewa*	*Records of generating station/ Consuming process*	*Kgs*	*m*	*monthly*	*100%*	*Electronic*	*The effect of bio-mass use is not accounted for as the bio-mass switch is a separate project idea. If any bio-mass is used, it is converted back into eq coal quantity for same calorific value.*
I 05 (01….k)-02	*tQ – quantity of fuel(s) consumed for generation of thermal energy at Bela*	*Records of generating station/ Consuming process*	*Kgs*	*m*	*monthly*	*100%*	*Electronic*	*-do*
I 06 (01….k)-01	*tCV- calorific value of fuels (HCV) consumed for generation of thermal energy at Rewa*	*Laboratory records or certificates of supplier*	*KJ/Kg*	*C*	*monthly*	*100%*	*Electronic*	*Calculation of this value is by wtd average value of fuel lots received and consumed (as per FIFO accounting method; wtd with weight consumed)*
I 06 (01….k)-02	*tCV- calorific value of fuels (HCV) consumed for generation of thermal energy at Bela*	*Laboratory records or certificates of supplier*	*KJ/Kg*	*C*	*monthly*	*100%*	*Electronic*	*-Do-*
I 07 -01	*eEP-purchased electrical energy from the grid at*	*Electricity Meter for the Project*	*KWHr*	*m*	*monthly*	*100%*	*Electronic*	*Can be negative if the plant has been net exporter of the energy*

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
	Rewa	*Boundary*						
I07-02	*eEP-purchased electrical energy from the grid at Bela*	*Electricity Meter for the Project Boundary*	*KWHr*	*m*	*monthly*	*100%*	*Electronic*	*Can be negative if the plant has been net exporter of the energy*
I 8	*EF- emission factor of the grid*	*Published statistics by National Electricity Authority or other such body*	*kg of Co2/KWH r generated*	*e*	*Annual*	--	*Electronic*	*Based on TERI published data for Central grid in India- average emission factor*
I 9	*TD- transmission and distribution losses*	*Published statistics by National Electricity Authority or other such body*	*%*	*e*	*Annual*	--	*Electronic*	*Based on Central Electricity Authority Estimates for such losses/TERI data*

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

>>

Initial emission levels from the Plant

Q_0 = quantity of production (of the main product) by the plant = 4,639,577

reE_0 = ratio of generated electrical power to consumed electrical power = 61.39%

esE_0 = specific electrical energy consumption KWHr /unit of production = 93.79

tsE_0 = specific thermal energy consumption KJ/unit of production = 2,376,653

Rest of the factors same as for Post Project Implementation.

TEF_0 = Emission factor of specific energy consumed

= $(esE_0 \bullet ((1-reE_0) \bullet EF_0 / (1-TD_0) + reE_0 / eeffy_0 \bullet eFEF_0 \bullet K) + tsE_0 / teffy_0 \bullet tFEF_0)$ = 327.0 KG C02/T of cement

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

This option is not being used.

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

>>

No significant leakages are expected from the plan. Hence no monitoring mechanism is being suggested.

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

>>

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.)

>>

aQ_T = Quantity of production which should be accounted for as the effect of the Project Activity
= 5,669,969 T

Specific Emission reduction

ΔsE_t = MIN (($\mathbf{TEF_{b,t}}$ - $\mathbf{TEF_{T,0}}$), 0) **(9)**

= 19.1 Kg of Co2/T of cement

Total GHG Emission reduction

ΔGE_t = Total GHG émission reduction

$= aQ_T \bullet \Delta sE_t$ **(10)**

= 1,08,447 T of Co2

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.
A 01-(01…n) : Q	*L*	*These measures are very accurate in a manufacturing plant, directly coming from financial accounts.*
A 02 : EG	*L*	*This is normally measured by very accurate meters in generating plants*
A 03 (01….n) :eQ	*L*	*These will need correction for product mix changes- across clinker and cement. The correction procedure is described in baseline methodology*
A 04(01….n) :eCV	*L*	*Since actual values are being measured, this is likely to be more accurate than standard IPCC default values.*
A 05(01…n) :eCF	*L*	*Since actual values are being measured, this is likely to be more accurate than standard IPCC default values.*
A 06 (01….n): tQ	*L*	*These will need correction for product mix changes- If different products use significantly different levels of energy. The correction procedure is described in baseline methodology*
A 07 (01….n) :tCV	*L*	*Since actual values are being measured, this is likely to be more accurate than standard IPCC default values.*
A 08(01…n) :tCF	*L*	
A 09 :eEP	*L*	*This is normally measured by very accurate meters*
A 10 : EF	*M*	*Although published reports from TERI may be late (by 1-2 yrs), it is better to stick to these reports, as the data may be more authentic than a survey based data, apart from being in-expensive. In any case while building a series for a long period (7-21 yrs), the estimation incorrectness by delayed availability of data may not result in too much of correction.*
A 11 :TD	*M*	*-same as-above*
I -01-(01…n): Q	*L*	*Same as for A -01*
I -02 :EG	*L*	*Same as for A-02*
I -03 (01….n):eQ	*L*	*Same as for A-03*
I- 04(01….n) :eCV	*L*	*Same as for A-04*
I -05(01…n) :eCF	*L*	*Same as for A-05*
I -06 (01….n) :tQ	*L*	*Same as for A-06*
I- 07 (01….n) :tCV	*L*	*Same as for A-07*
I -08(01…n) :tCF	*L*	*Same as for A-08*
I -09 :eEP	*L*	*Same as for A-09*
I -10 : EF	*M*	*Same as for A-10*

I- 11 :TD	*M*	*Same as for A-11*

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

>>

The Rewa plant has a Process department (handling process engineering, technical services and projects) which monitors energy consumption also. This department will track the Project Emissions for both Rewa and Bela plants.

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

>>The monitoring methodology was developed by (Vinod Kala) EVI, the particulars, address given in the annex-1

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

>>

Post project implementation, Bela and Rewa Plant emissions are estimated as follows:

	Rewa	Bela	Total
Post Project emissions T of Co2	1,057,274	688,636	1,745,910

E.2. Estimated leakage:

>>

Leakages are not estimated as per methodology as they are expected to be minor and would be more that compensated by the omission of the other ‘ Kyoto gases’ (such as N2O, whose emissions will be reduced as a direct result of the reduction of fuel consumption due to the project activity) from the scope of this document.

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

>>

	Rewa	Bela	Total
Post Project emissions T of Co2	1,057,274	688,636	1,745,910

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

>>

2004-05									
1	2	3	4	5	6	7	8	9	10
1,854,357	1,854,357	1,854,357	1,854,357	1,854,357	1,854,357	1,854,357	1,854,357	1,854,357	1,854,357

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

>>

For the first year, therefore the project reduces 1,854,357 – 1,745,910 T of Co2 ~ 108,447 T of Co2

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

>>

2004-05									
1	2	3	4	5	6	7	8	9	10
108,447	108,447	108,447	108,447	108,447	108,447	108,447	108,447	108,447	108,447

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts, including trans-boundary impacts:

>>

The project results in net reduction of fuel consumption. Except for energy used while producing plant and equipment used in the Project, no adverse impact on the environment is expected. Due to process changes, no impact on emission of any other kind is expected.

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:

>>

Energy efficiency projects are not required to undertake Environment Impact Assessment as per existing policies of the State.

SECTION G. Stakeholders' comments

>> JPA is well known for its investment for local development projects (schools, lake development, restoration of local cultural/religious sites etc[11]) and the locals are very positively inclined towards JPA.

Stakeholder comments have been invited in formal meetings as well as letters (written to local authorities)

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

>>

Stakeholder comments have been invited in formal meetings as well as letters (written to local authorities).

Letters were written to local office of State Electricity Board as well as District Collector.

Local village community was invited to a meeting where the purpose of the project was explained. Thereafter comments were invited from them.

The Sarpanch (Village Chief) was present in the meeting.

G.2. Summary of the comments received:

>>

No adverse comments received.

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

>>

No action required as no adverse comment received.

[11] brief summary of such activities undertaken by JPA is enclosed in annex 3.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Jaiprakash Associates Ltd
Street/P.O.Box:	Basant Lok, Vasant Vihar
Building:	JA House, 63
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State/Region:	New Delhi
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URL:	
Represented by:	R B Singh
Title:	Jt President (Finance)
Salutation:	Mr
Last Name:	Singh
Middle Name:	B
First Name:	R
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For Emergent Ventures India Pvt Ltd – Advisors

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URL:	www.emergent-ventures.com
Represented by:	Vinod K Kala
Title:	Director
Salutation:	Mr
Last Name:	Kala
Middle Name:	Kumar
First Name:	Vinod
Department:	Consultancy
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Direct FAX:	
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For Host Country – India- the party involved in the project

Organization:	Designated National Authority (CDM)- India, Ministry of Envioronment and Forests
Street/P.O.Box:	CGO Complex, Lodhi Road
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State/Region:	New Delhi
Postfix/ZIP:	110 003
Country:	India
Telephone:	91-11-24362252
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E-Mail:	rksethi@menf.delhi.nic.in
URL:	www.envfor.nic.in
Represented by:	Mr R K Sethi
Title:	Director
Salutation:	Mr
Last Name:	Sethi
Middle Name:	K
First Name:	R
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No Public Funding Obtained.

Annex 3

BASELINE INFORMATION

1: **Profile of Plants of JPA**

Plant	Set up yr	Capacity	Unique points	
Rewa (JP Nagar- 18 KM distance from Rewa)- MP,	1986 U-1	1.00million T Clinker; after Project will move to 1.50 million T (3200 TPD)→ 4700 TPD)	Total de-bottlenecking after Project 2004: 14600 TCD→ 16900 TCD Through ▪ Coolers- new generation grate cooler ▪ Pre-heater 4 stage→ 6 stage (reduction 110 KCAL/ kg of Clinker) ▪ Improved kiln burning and sealing ▪ Pneumatic conveying of raw meal to mechanical conveying.	
	1992 U-2	1.50 million T Clinker; after Project would move to 1.70 million T (4800 TPD→5500 TPD)		
Bela- JP Puram – MP, near SATNA	1996	1.70 million T Clinker; after Project would move to 2.3 million T (5700 TPD→ 6700 TPD)		Roller press installed for first stage of grinding (to reduce power consumption)
	Total	4.20 million T Clinker→ 5.5 million T		
Sadva Khurd, UP (120 KM	2001	15000 T/m flyash consumption	Clinker ground at Rewa is transported in loose packing (tanker) to Sadva	

from REWA)			where it is mixed with Flyash (sourced from Unchahar NTPC plant next door). 30% flyash content right now; likely to increase to 34%. There is a blending unit here and packing is also done here. Sold in UP market.	
TANDA 220 KM from REWA	2004 (new)	1.0 million T clinker grinding unit	Flyash comes from NTPC TANDA. Clinker grinding to be done here as well. Vertical roller mill to be used.	

Improvements being made in Plants at Rewa and Bela are part of the Project discussed here. These improvements are summarized in the coming pages.

2: JAYPEE REWA PLANT- I

PROCESS IMPROVEMENT PLAN: KILN SECTION

Sl. No	Improvement Measure	Improvement	Remark
1.0	Installation of Modern Duoflex burner	Saving in Specific Heat consumption	Modern Duoflex burner requiring 7-8% primary air as against 15-16% reqd. in old burner. Air jet along with swirl action is issuing out of the burner tip section at near sonic velocity sucks in combustion air with reduced cold primary air for better combustion.

2.0	Installation of six stage SLC Pre-heater replacing existing four stage ILC Pre-heater.	Saving in Specific Heat consumption and Saving in Specific Power consumption	New separate line calciner (SLC) with 6 stages of heat transfer replacing old inline calciner (ILC) with 4 stages. Additional 2 stages transfer additional heat to the Kiln feed and will reduce the PH exhaust temp to 290 - 300^{0}C. from 400 – 420^{0}C in the old Pre-heater. In the new SLC calciner better coal combustion will take place using hot tertiary air coming from Kiln hood at approx 850 – 900^{0}C. and having 20.9% v/v oxygen content whereas in the old ILC calciner, coal combustion occurred in a mixed environment of oxygen depleted gases from Kiln and tertiary air from the Kiln hood . The reduced convective heat loss due to above reasons, less fuel is required and hence less combustion air is needed. The consequent reduction in PH gas volume (NM3/Hr and less Temp) will reduce the fan power consumption.
3.0	Installation of IKN KIDs and CFG Grate Plates in first grate High efficiency fans to be installed in grate cooler with V/F speed control.	High heat recuperation efficiency resulting saving in specific heat consumption. More availability due to less wear and tear. Power saving due to higher eff. Of fans & speed control.	New generation cooler plates initial static inlet (IKN) allow better heat recuperation efficiency and require less specific cooling air quality (2.1 NM3/Kg. CLK) from 2.16 NM3/Kg. Clk) & 20 KcaL/Kg. ClK saving) // CFG plates in 1st grate (i.e. heat recuperation area) facilitate more uniform air distribution compared to old conventional grate plates thus improving heat recuperation and more availability due to less moving parts..

Sl.	Improvement Measure	Improvement Impact	Remark

No			
4.0	Improved sealing of Kiln at inlet and outlet.	Saving of Electrical and thermal energy.	Lamella type seal at Kiln outlet and labyrinth-sealing arrangement at Kiln inlet will prevent cold air entry into the hot Kiln reducing fuel consumption and also PH fan loading.
5.0	Improved insulation	Less Radiation losses from the shell of TA duct, preheater, kiln hood and cooler resulting in saving of thermal energy.	Type and thickness of insulation has been improved using calcium silicate blocks of 100 & 150 THK replacing thinner cal. Silicate blocks . + Insulyte castable insulation in the Kiln hood, cooler, Pre-heater and TA duct areas which will reduce the shell temp. and radiation losses.
6.0	Pneumatic Kiln feed system changed by Mechanical conveying (Bucket elevator)	Saving in electrical energy by restricting cold air entry.	Besides saving in Electrical energy consumption by changing over to mechanical transport it will also reduce the PH fan power due to reduction of gas flow handled by the PH fan by an amount equivalent to the transport air.
7.0	Replacing coal dozing system	Smooth Coal flow for Kiln & PC firing.	From loss in weight system (TVR) to twin screws impact flow meter system The old TVR system controlled Coal dozing rates by computation of rate of loss in weight between 2 limiting bin levels. During filling there were disturbances in coal flow leading to CO generation requiring increased airflow for CO dilution thus increasing the PH fan power. The twin-screw impact flow meter arrangement gives smooth coal flow.

JAYPEE REWA PLANT- I
PROCESS IMPROVEMENT PLAN: RM SECTION

Sl. No	Improvement Measure	Improvement Impact	Remark
1.0	Dynamic separator to be installed replacing static separator	Better Residue control from 18-19% to 15% on 90 Micron. Increase in Mill out put and reduction in Specific	Better particle size distribution which will improve burnability in Kiln. Reduction in specific power consumption due to increase in

		power consumption	mill output as over grinding will occur.
2.0	Adjustable nozzle ring & High capacity bucket elevator to be installed.	Mill output will increase.	Nozzle velocity will reduce from 65-68 M/Sec. to 55–58 M/Sec. with reduction in Mill Diff. Pressure and reduced material recirculation by gas. More material will be re-circulated mechanically by the larger bucket elevator. The scope generated in the fan will result in increased capacity of Mill.

JAYPEE REWA PLANT- I
PROCESS IMPROVEMENT PLAN: COAL MILL SECTION

Sl. No	Improvement Measure	Improvement Impact	Remark
1.0	Static Separator of Coal Mill to be replaced by high efficiency LNV classifier	Better residue control ensures proper burning of Coal. Increase in production and reduction in specific power consumption.	Sp. Power consumption reduced from 6.0kWh/T. clk. to 4.8-5.3 kWh/T. clk

JAYPEE REWA PLANT- II
PROCESS IMPROVEMENT PLAN: KILN SECTION

Sl. No	Improvement Measure	Improvement Impact	Remark
1.0	Modification of existing top stage cyclones to high efficiency low pressure drop cyclones.	Kiln capacity will be increased from (5200 TPD to 5700 TPD), Specific thermal energy consumption will be reduced.	The heat consumption per ton of clk will reduce as the heat losses will remain same and will be distributed over higher clinker production Possible improvement of Thermal Energy Consumption of 10 Kcal/kg of Cl
2.0	Replacement of Kiln drive	Kiln speed to be increased to take care of higher production.	-

JAYPEE BELA PLANT
PROCESS IMPROVEMENT PLAN: KILN SECTION

Sl. No	Particular	Improvement Measure	RemarK
1.0	Modification of Preheater top cyclones to high efficiency low pressure drop cyclones.	Kiln capacity will be increased from (5700 TPD to 6700 TPD)	The heat consumption per ton of clk will reduce as the heat losses will remain same and will be distributed over higher clinker production.

2.0	New generation cooler with static inlet (CIS) and Mechanical flow regulators (MFR) replacing dynamic CFG plates	Recuperation efficiency will increase	Air distribution to each cooler plate is automatically controlled by MFR leading to improved recuperation.
3.0	Installation of Modern duoflex burnner	Proper coal combustion with less primary air.	Modern duoflex burner requiring 7-8% primary air as against 10-12% reqd. in old burner. Air jet along with swirl action is issuing out of the burner tip section at near sonic velocity sucks in combustion air for better combustion with reduced cold primary air.

JAYPEE BELA PLANT

PROCESS IMPROVEMENT PLAN:CEMENT MILL SECTION

Sl. No	Improvement Measure	Improvement Impact	Remark
1.	Roller press installed for Pre – Crushing and pre-grinding of clinker	Increase in Mill out put from 150 TPH to 230 TPH hence reduction in Sp.power consumption kWh/T. cem.	Compressive force is predominant in roller press .Ball Mills are energy inefficient due to wastage of energy through impact in grinding process in the form of heat and noise. Possible saving 2KWHr/T
2.	Dry fly ash handling system	Better clk to cement conversion, considerable reduction in Sp. power consumption kWh/ T. cem	Due to availability of dry fly ash the consumption of the same will go up from 20-25 % to 30-35 %. Due to the free flow of dry flyash the jamming of hoppers , mill inlet chutes and mill 1st chambers will be reduced and more flyash dosing into the system will be achievable.

Work done by JPA for local community:

JPA is highly respected by local community for the work done by them for local stakeholders.They began this work in 1996.
They have chosen to work in the areas of Education, Healthcare, Animal Care, Surface Communication (roads) and Drinking Water.

The key achievements of the work done so far are

- Villages covered ~ 22
- Surface communication - connected all villages to main roads.
- Drinking water - ran community water schemes including pumped water supply etc. However after initial trials have modified the approach and now the focus is on Borewells. They have implemented 100 borewells.
- Socio religious needs - restored a 400 year simple.
- Healthcare - free medicare for all villagers at JP HOSPITAL. Every villager has been allotted a health card which entitles him/her to free treatment, free check-up and ambulance. 500-600 OPD cases a day and 60% of them are non employees.
- Education - Balwadis - Balwadi teachers are educated ladies from the village.
  - 1999 – began with 334 students
  - 2004 - 1650 students now. The balwadis operate in 2 shifts (1st shift – primary , 2nd – higher classes). There are 44 teachers and 2 batches of 12th class have passed out.
  - Started bridge classes for girls of 8 – 12 years – helped them pass 5th class of M.P. Board.

- Veterinary doctors – animal husbandry camps are available about 2 in each village. There are some NGOs in Rewa but nobody works in these 22 villages. Team of 4 social workers – two more being added.

3: Table of Improvements

	UOM	Current	Post Projec	Improvement
U-1 Rewa Plant				
Kiln				
Thermal energy consumption	Kcal/Kg Cl	788	697	91.0
Electrical Energy Consumption	KWHr/T Cl	30.5	16.5	14.07
Capacity Increase	TPD	2878	4500	1622
Raw Mill Section				
Electrical Energy Consumption	KWHr/T Cl	29.5	26.10	3.45
Coal Mill				
Electrical Energy Consumption	KWHr/T of Cl	6.0	5.0	1.0
U-2 Rewa Plant				
Kiln				
Thermal Energy Consumption	Kcal/kg of Cl	729	720	9.0
Capacity Increase	TPD Cl	5200	5700	500
Bela Plant				
Kiln				
Thermal Energy Consumption	Kcal/kg of Cl	715	686	29
Electrical Energy Consumption	KWHr/T of Cl	26.5	23.0	3.5
Capacity Increase	TPD Cl	5700	6700	1000
Cement Mill				
Electrical Energy Consumption	KWHr/T of cem	40.0	38.0	2.0

4: Data for electricity generation and fuel consumption

JAYPEE REWA PLANT FOR FY 2003-2004				
PARTICULARS	TOTAL	AUXILIARY	NET	
PURCHASES FROM MPEB	90393300	0	90393300	
FROM CPP	31672000	2603660	29068340	
FROM DG	123121620	7365280	115756340	
ADD: FROM JBP	675100	0	675100	
TOTAL CONSUMPTION	245862020	9968940	235893080	
LESS COLONY CONS.	-	-	1579280	
CONSUMPTION IN PLANT			234313800	
Fuel consumed	Units	JRP	density Kg/Litre	Carbon Factor by Wt
HSD consumed in DG	Ltr	2441840	0.845	86.6%
HFO consumed in DG	Ltr	28019856	0.845	86.6%
LDO consumed in DG	Ltr	190221	0.845	86.6%
Coal Consumption	Kg	19085474	1.000	53.9%
Calorific vlaue of HSD	Kcal/Kg	10300		
Calorific vlaue of HFO	Kcal/Kg	10500		
Calorific vlaue of LDO	Kcal/Kg	10420		
Coal	Kcal/Kg	4916		

JAYPEE BELA PLANT				
PARTICULARS	TOTAL	AUXILIARY	NET	
PURCHASES FROM MPEB	64563721	0	64563721	
FROM CPP	0	0	0	
FROM DG	109754022	6449982	103304040	
LESS: TO JRP	675100	0	675100	
TOTAL CONSUMPTION	173642643	6449982	167192661	
LESS COLONY CONS.	-	-	174099	
CONSUMPTION IN PLANT			167018562	
Fuel consumed	**Units**	**JBP**	density Kg/Litre	Carbon Factor by Wt
HSD consumed in DG	Ltr	117750	0.845	86.6%
HFO consumed in DG	Ltr	25840655	0.845	86.6%
LDO consumed in DG	Ltr	0	0.845	86.6%
Coal consumption	0	0	1.000	0.0%
Calorific vlaue of HSD	Kcal/Kg	10300		
Calorific vlaue of HFO	Kcal/Kg	10500		
Calorific vlaue of LDO	Kcal/Kg	10420		

5: **Estimated Product Mix Factors**

Electrical Energy Consumption					
	Product Mix Rewa		KWHr/T		
	Current	Target	Current	Target	Improvement
Clinker for sale	266,834	967226	71.90	63.73	8.17
Cement for sale	2,413,741	2413741	97.90	91.45	6.45
Average/Total	2,680,575	3380967	95.3	83.5	
	Product mix factor			1.054	
	Corrected sp electrical energy consumption			88.0	

	Product Mix Bela		KWHr/T		Improvement
	Current	Target	Current	Target	
Clinker for sale	121,198	451198	64.60	61.10	3.5
Cement for sale	1,837,805	1837805	93.50	88.60	4.91
Average/Total	1,959,003	2289003	91.7	83.2	
	Product mix factor			1.045	
	Corrected sp electrical energy consumption			86.9	

Thermal Energy Consumption					
	Product Mix Rewa		KJ/T		
	Current	Target	Current	Target	Improvement
Clinker (sale)	266,834	967226	2935087	2745933	189154
Cement for sale	2,413,741	2413741	2318719	2169287	149432
Average/total	2,680,575	3380967	2380074	2334254	
	Product mix factor			0.954	
	Corrected sp thermal energy consumption			2226688	

	Product Mix Bela		KJ/T		Improvement
	Current	Target	Current	Target	
Clinker (sale)	121,198	451198	2822038	2700615	121423
Cement for sale	1,837,805	1837805	2342292	2241510	100781
Average/total			2371972	2332007	
	Product mix factor			0.973	
	Corrected sp thermal energy consumption			2269914	

6: Emission Model

Emission Model							
Parameter	UOM	Rewa Plant			Bela Plant		
		Current	Post Project	Improvement	Current	Post Project	Improvement
Clinker for supply	T	266,834	967226	700392	121,198	451198	330000
Cement for supply	T	2,413,741	2413741	0	1,837,805	1837805	0
Total Production		2,680,575	3,380,967	700,392	1,959,003	2,289,003	330,000
Clinker to cement ratio	T/T of cement	79.0%	79.0%	0.0%	83.0%	83.0%	0.0%
tsE (Specific thermal consumption _corrected for product mix)	KJ/T of cement	2380074	2226688	153386	2371972	2269914	102058
esE (Specific energy consumption corrected for product mix)	KWHr/T of cement	95.31	88.00	7.32	91.71	86.88	4.83

Emission Model							
Parameter	UOM	Rewa Plant			Bela Plant		
		Current	Post Project	Improvement	Current	Post Project	Improvemen
rE (Fraction of energy generated in-house)		0.614	0.614	0.000	0.613	0.613	0.000
eEffy (electrical generation efficiency	%	29.9%	29.9%	0.000	38.3%	38.3%	0.000
eCF (carbon factor for fuels used for electrical power generation)	Kg of C/Kg of fuel	68%	68%	0.000	86.6%	87%	0.000
EF (emission factor for the grid)	Kg of Co2/KWhr of power generated	0.91	0.91	0.000	0.91	0.91	0.000
TD (transmission and distribution losses)	%	34.60%	34.60%	0.000	34.60%	34.60%	0.000
tCF (carbon factor for fuels used in thermal energy generation)	Kg of C/Kg of fuel	54%	54%	0.000	54%	54%	0.000
teffy - efficiency of thermal energy consumption	%	1.00	1.00	0.000	1.00	1.00	0.000
eCV (calorific value of fuels used for electrical power generation)	KJ/Kg	31407	31407	0.000	43960	43960	0.000
tCV (calorific value of fuels used for thermal energy generation)	KJ/Kg	20581	20581	0.000	20581	20581	0.000
TEF	**Kg of C02/T of cem**	**335.7**	**312.7**	**23.0**	**315.3**	**300.8**	**14.4**

7: CER Estimates

Parameters	UOM	2003-04	2004-05 1	2	3	4	5	6	7	8	9	10	
Specific thermal consumption; itsEt	KJ/T	2376653	2376653	2376653	2376653	2376653	2376653	2376653	2376653	2376653	2376653	2376653	
Specific electrical energy consumption; iesEt	KWHr/T	93.79	93.79	93.79	93.79	93.79	93.79	93.79	93.79	93.79	93.79	93.79	
Baseline (TEFi)	**Kg of C02/T of cem**	**327.0**	**327.0**	**327.0**	**327.0**	**327.0**	**327.0**	**327.0**	**327.0**	**327.0**	**327.0**	**327.0**	
TEF(T)		307.9	307.9	307.9	307.9	307.9	307.9	307.9	307.92	307.9	307.9	307.9	
ER			108447	108447	108447	108447	108447	108447	108447	108447	108447	108447	1084469
Expected Price of Ers	$/ER		6	8	10	10	10	10	10	10	10	10	
$:Re			45	45	45	45	45	45	45	45	45	45	
Value of ER s (Post tax)	Re Mill		18.6	24.8	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	

NPV	210.56	Rs Mill
@	6%	as CER values are expected to be more stable

8: Financial Analysis

Assumptions

	UOM	Current	Target	Improvement
Production		2003-04		
Clinker	T	388,031	1,418,423	1,030,392
Cement	T	4,251,546	4,251,546	0

Total			4,639,577	5,669,969	1,030,392

Specific Energy Consumption					
	Electrical	KWHr/T	93.8	87.5	6.2
	Thermal	KJ/T	2,376,653	2,244,139	132,514
Average calorific value of fuel for electric power generation		KJ/Kg	34,848	34,848	
Average calorific value of fuel for thermal power generation		KJ/Kg	20,853	20,853	
Average price of fuel for electric power generation		Rs/MT	10.38	10.38	
Average price of fuel for thermal power generation		Rs/MT	1.82	1.82	
eeffy			32.6%	32.6%	
teffy			100%	100%	

Price of Products			
Clinker	Rs/T	1378	1378
Cement	Rs/T	1799	1799

Investment in the energy effy projects	Rs Mill	1270

Cost of Capital		
		Aswath Damodaran (Investment Valuation) : market risk premium in India = market risk premium in US (4%)+
Market risk premium	9.50%	country risk (5.4%~6%)
beta (due to high risks of wind varaibaility and collection risks from SEB)	1.5	
Treasury 10 yrs yield	6.20%	Aug 04 rates; may firm up further

Equity cost	20.5%
D:E ratio	1.5
Marginal Tax rate	36.59%
Interest rate for the client	11%
Weighted Average Cost of Capital	12.4%

	1999-2000	2000-01	2001-02	2002-03	2003-04	Average, 5 yrs
PBDIT/sales	4.19%	10.64%	19.58%	14.72%	13.00%	12.43%

	Current	Future
Profitability of the business (PBIDT/sales; last 5 yrs average))	12.43%	12.43%

9: Cashflow Model:

Cashflow analysis		1	2	3	4	5	6	7	8	9	10	
Incremental sales	Rs Mill	1420	1420	1420	1420	1420	1420	1420	1420	1420	1420	
Incremental PBDIT		176	176	176	176	176	176	176	176	176	176	
Savings from energy efficiency		182	182	182	182	182	182	182	182	182	182	
Total operating cashflow		359	359	359	359	359	359	359	359	359	359	
Depreciation = assumption that this level of money will need to be re-invested to keep the investment in good health @	10.00%	127.0	127.0	127.0	127.0	127.0	127.0	127.0	127.0	127.0	127.0	
EBIT		232	232	232	232	232	232	232	232	232	232	
Freecashflow= EBIT(1-t)-Inv	-1270	147	147	147	147	147	147	147	147	147	147	1001
NPV	(155.60)											Terminal
IRR	9.77%											Value at 75%
IRR with NPV of Ers	12.97%											

Sensitivity Analysis	EBIDTA margin		10%	12%	13%	14%	16%
	IRR	9.8%	7.2%	9.3%	10.4%	11.4%	13.3%

Annex 4

MONITORING PLAN

Please refer to part D of this PDD.