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:

“Switching fossil fuels in an industrial facility” by Indorama Cement Ltd
Version: 1.4
Date: 05.01.2007

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

Indorama Cement Ltd. (IRCL) belongs to Indorama SPL group having diversified business interests in chemical, textile and cements. The Group has manufacturing facilities in Indonesia, Thailand, **India**, Turkey, Sri Lanka and marketing offices in Europe, Africa, Latin America, Hong Kong and Singapore. IRCL has a cement manufacturing capacity of 0.972 MTPA at Raigarh, Maharastra. IRCL is catering to cement demand in western India (mainly to state of Maharashtra). IRCL is the only cement company in the western region of India to produce Portland Slag Cement (PSC).

In the project activity Indorama Cements Ltd. (IRCL) is using waste gases from the blast furnace, herein after referred to as Blast Furnace Gas (BFG), from neighbouring steel plant as fuel in Hot Air Generator (HAG).Prior to start of the project activity LDO was being used for HAG, hence the project activity displaces use of LDO in hot air generation and results into reduction in GHG emissions associated with LDO burning. For utilising BFG as fuel IRCL has installed system for carrying the BFG from steel plant to its unit along with complete set of gas train arrangement and a dual fired HAG.

Hot air is required for drying the clinker, slag & gypsum to the permissible limits before grinding to make PSC. For drying the clinker, slag & gypsum IRCL uses hot air generated in a hot air generator where LDO was burned as fuel to meet the thermal energy demand. In the project activity IRCL uses waste BFG as fuel displacing LDO consumption. The project activity largely depends on the availability of BFG from the steel plant, which is in no way under the control of IRCL and any investments in the project activity thus carry an inherent risk of not getting enough BFG. There is also a risk of not getting proper and consistent quality BFG, which increases uncertainties in the cement production process.

Sustainable Development:
Proposed CDM project activity has following sustainable development aspects:

Social well being:
The project activity helps in reduction of GHG emissions which otherwise would have generated from LDO burning in HAG. It also helps in conservation of natural resources i.e. LDO contributing towards energy security of the nation to some extent. The project activity has also generated employment opportunities during installation, operation and maintenance for the same.

Economic well being:
Since this project activity is first of its kind to be started in a cement industry, successful implementation will encourage similar kind of projects and funding for R&D of technological improvements.

Environmental well being:
Activities during construction & operation did not affect the bio-diversity in the region. There is no impact on soil, water quality, and forest cover due to the power project. Use of waste energy in place of

fossil fuel has also helped in conservation of the natural resource. Avoidance of LDO as a fuel helps in reduction of Greenhouse gas emissions.

Technological well being:
The technology used in the project activity is indigenous. Success of project activity will further encourage efforts in improving the machinery and technology.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) Project participants (*) (as applicable)	Kindly indicate if the party involved wishes to be considered as project participant (yes/no)
Government of India	Indorama Cement Ltd.	No

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

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

A.4.1.1. Host Party(ies):

Host Country: India

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

State of Maharashtra

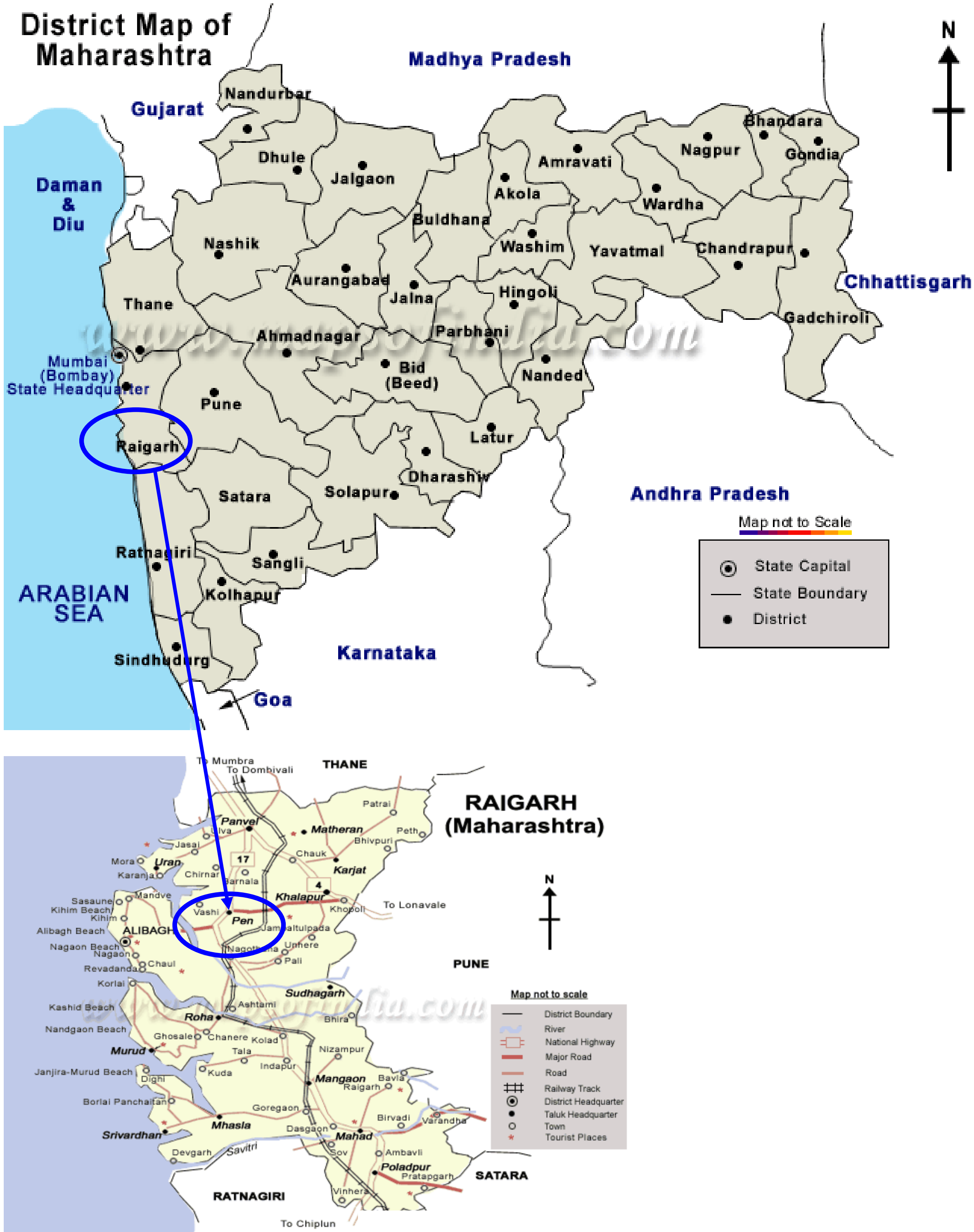
A.4.1.3. City/Town/Community etc:

Village : Khar Karvi
Taluka : Pen
District: Raigarh

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

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

18° 39' North, 72° 55' East

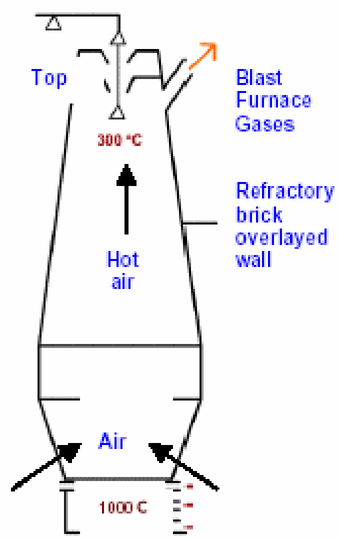


A.4.2. Type and category(ies) and technology of the small-scale project activity:

The project is a small scale CDM project activity. The project activity uses approved methodology for small scale activities AMS "**TYPE III-B: Switching fossil fuels"** of Appendix B of the simplified modalities and procedures for small-scale CDM project activities. As per category IIIB, the project activity should directly emit less than 15 kilo tones per annum. The project activity results into direct emissions below 15 kilo tones per annum.

IRCL produces Portland Slag Cement (PSC) and Ground Granulated Blast Furnace Slag (GGBS) in the plant (Blast furnace slag is procured from nearby steel plant). The production processes require drying of slag and clinker, the main constituents for manufacturing PSC & GGBS. The drying of slag, clinker and gypsum is done with hot air, which is generated in a Hot Air Generator (HAG). The fuel used in HAG in the normal course is LDO which is carbon intensive and results into GHG emissions when burned. In the project activity IRCL uses waste blast furnace gases (BFG) in place of LDO as fuel. To carry BFG from the steel plant, IRCL has installed a network of pipes and ducts along with complete set of gas train arrangement and dual fired HAG has also been installed.

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:



A typical diagram of Blast furnace (source of BFG)

The blast furnace gas coming out of the top, with un-burnt component, which in normal circumstance is flared, is used as a fuel in place of LDO in Hot Air Generator (HAG). The greenhouse gas considered in the baseline calculations is CO2 from LDO burning.

The project activity has resulted in avoidance of LDO burning for hot air generation. LDO burning results in GHG emissions and thus cutting on consumption of LDO thereby the project activity has helped in reduction of GHG emissions. In the absence of project activity IRCL would have continued generating hot air using LDO burning in hot air generator.

The project activity faces many barriers such as financial and operational to implementation and would not have come-up without accounting for CDM benefits.

The total of GHG emissions reduction from the project activity in tones of CO2 equivalent = 106,000 tCO2e over the crediting period of 10 years.

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

Years	Annual estimation of emission reductions in tones of CO2 e
2006-2007	10600
2007- 2008	10600
2008- 2009	10600
2009- 2010	10600
2010- 2011	10600
2011- 2012	10600
2012- 2013	10600
2013- 2014	10600
2014- 2015	10600
2015- 2016	10600
Total estimated reductions (tonnes of CO2 e**)**	106000
Total number of crediting years	10 years fixed crediting period
Annual average over the crediting period of estimated reductions (tonnes of CO2e**)**	10600

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

No public funding for the project activity.

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

As per Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities – “A proposed small-scale project activity shall be deemed to be a debundled 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”

The project activity is not a de-bundled component of a large project activity as –

There is no small scale CDM project activity or an application registered by IRCL, in the same project category in the last two years within 1 km of the project boundary of the proposed small-scale 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:

The project is a small scale CDM project activity. It is based on "**TYPE III-B: Switching fossil fuels**" of Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

Reference: Version 9, Scope 1, dated 28/07/2006

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

As described in category TYPE III-B "*This category comprises fossil fuel switching in existing industrial, residential, commercial, and institutional or electricity generation applications. Fuel switching may change efficiency as well. If the project activity primarily aims at reducing emissions through fuel switching, it falls into this category. If fuel switching is part of a project activity focused primarily on energy efficiency, the project activity falls in category II.D or II.E. Measures shall both reduce anthropogenic emissions by sources and directly emit less than 15 kilo-tonnes of carbon dioxide equivalent annually*."

The project activity from IRCL is a fuel switch project where LDO has been replaced by BFG from a steel plant. The project activity helps in GHG emissions reduction associated with LDO burning. It directly emits emit less than 15 kilo-tonnes of carbon dioxide as required by the category applied.

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:

Proposed project activity is eligible to use simplified methodologies as

- It conforms to project category in "Appendix B of the simplified modalities & procedures for small scale CDM-project activities under AMS TYPE IIIB– "***Switching fossil fuels***"
- Measures have reduced anthropogenic emissions by sources and direct emissions are less than 15 kilo-tonnes of carbon dioxide equivalent annually.
- It is not a debundled component[1] of a larger project activity, as it qualifies guidelines in "appendix C to the simplified M&P for the small-scale CDM project activities for guidance on how to determine whether the proposed project activity is not a debundled component of a larger project activity"

[1] Refer section A.4.5

Establishing Additionality

Project Alternatives:

Scenario 1: Continuation of LDO burning in hot air generation
This is a continuation of existing practice. This scenario faces no barriers hence it is the most probable option.

Scenario 2: Installation of system for utilising the waste blast furnace gases as fuel in hot air generator in project activity.

Additionality of the project activity has been established as per the guidelines suggested in Attachment A to Appendix B.

Technological Barrier:
Stable and reliable combustion of BFG in Hot Air Generator is problematic due to its low calorific value, presence of particulate matter, moisture in BFG carried over from the scrubbing system which further lowers its calorific value and fluctuation in BFG pressure at HAG inlet. BFG is only a waste stream from the adjoining steel plant and maintaining its combustion quality is beyond the control of IRCL. The quality of BFG is also not the critical performance parameter for blast furnace operation in steel plant. There have been instances of erratic operation of the system due to this inconsistency in the quality of BFG and has led to problems of poor flame control in the burner and at times flame getting switched off at low pressure etc. The problem of erratic supply of BFG adds to the system under performance. Any shut-down or breakdown of blast furnace in the steel plant leads to cut-off of its supply to IRCL plant.

Due to uncertain quantity and quality of BFG plant operation suffers leading to production problems. On the other hand use of LDO poses no such problems to plant operations making it the natural choice for use as fuel in Hot Air Generator. But the use of LDO leads to GHG emissions.

So the main technical troubles can be listed as -

- Operational problems due to erratic BFG quality i.e. low calorific value, low gas pressure, presence of moisture at IRCL end.
- Uncertainties related to BFG supply from steel plant

IRCL had one LDO based HAG prior to the project activity. This HAG was not suitable to run on BFG as fuel and therefore IRCL installed a new HAG which could run on BFG in the project activity. So, IRCL could very well continue with its earlier operation on LDO based HAG and there was no other reason for installing new HAG but for using BFG.

Other barriers
It is not common practice in the region. This was a new project for IRCL and it had no prior experience in running this kind of operations. Till year 2000 COEN Bharat, the technological supplier to IRCL, had installed about 40 Hot Air Generators all across India. Among these about 20 were in the cement plants. Installation at IRCL was the only one with provisions to use BFG as fuel[2]. Slag used in PSC contains varying amount of moisture and thus need to be brought to a certain level for grinding in Vertical Roller

[2] Refer http://www.coenbharat.com/installations/i_install.htm

Mill (VRM). IRCL is the only PSC producing cement plant in the state of Maharashtra[3] (There are 8 cement plants in Maharashtra and none other than IRCL produces PSC). Data on such projects was not available on its successful operations in cement plants and that added to apprehension about the success of the project activity.

Summary

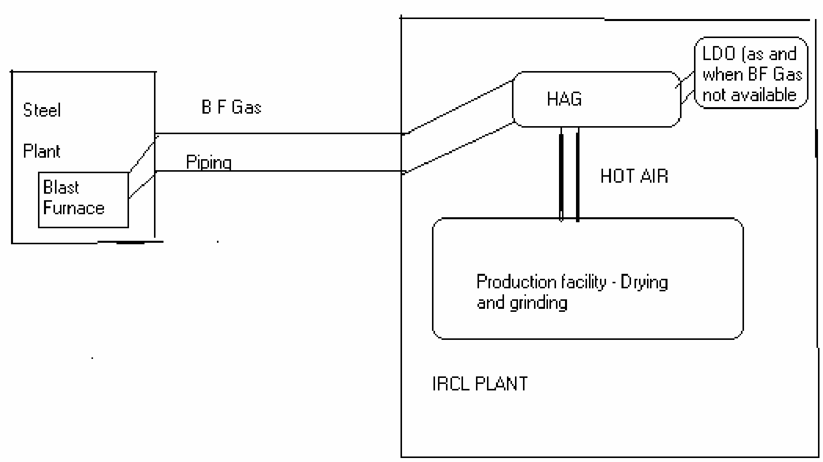
The proposed project activity is not a business-as-usual scenario and faces barriers as described above and thus is additional. These barriers are due to inconsistent quality of gas available and erratic availability which stall implementation of such type of project activity. The project activity is first of its kind for IRCL and also not mandated by law. In the absence of the project activity IRCL would have continued with LDO for hot air generation to meet its thermal energy requirement.

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:

"The project boundary is the physical, geographical site of the industrial facility, processes or equipment that is affected by the project activity".

This project boundary includes the production facility, Hot Air Generator (HAG), auxiliary equipments & machinery, piping and allied systems. The project boundary does not include sourcing steel plant and metering of blast furnace gas is being done at the PP's plant site too.

The emission reduction in the project activity is achieved only due to avoidance of LDO burning in the PP's plant. BFG would be flared at the steel plant before its release in the atmosphere in the absence of project activity.



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

[3] Other cement plants in Maharashtra: ACC - Chanda , Manikgarh Cement, Rajashree-Hotgi, L&T ACW, Ratnagiri, Orient Cement, Maratha Cement - *Cement Statistics 2004; Cement Manufacturers' Association;* *http://www.cmaindia.org/industry.html*

As per the methodology, "The emission baseline is the current emissions of the facility expressed as emissions per unit of output. Emission coefficients for the fuel used by the generating unit before and after the fuel switch are also needed. IPCC default values for emission coefficients may be used."

Method 1:
In the project activity, PP uses BFG to generate hot air, which is used to dry clinker and slag for production of Portland Slag Cement in the plant. Drying is required to bring the level of moisture in clinker and slag to the acceptable limit for grinding (below 0.5% in the final product). Thus, the output from the project activity is dried clinker and dried slag.

In the baseline years (prior to the project activity), LDO had been used in hot air generation. For estimation of baseline emissions, specific LDO consumption has been estimated based on past data for unit production of dry slag and unit production of dry clinker (Specific LDO consumption per unit of dry slag and per unit of clinker vary due to different moisture levels).

However, the moisture level in Slag and clinker may vary at different times (variations are more in case of slag). Due to this variation in moisture levels, LDO consumption per unit of dried slag and dried clinker may also vary (unlike power generation or steam generation where it can be estimated very correctly for per unit of power or energy output). So, emission baseline in terms of per unit of output (i.e. dried clinker and dried slag) may not always give conservative and most appropriate estimate of emission reduction in the project activity. Also, due to the fact that gaseous fuel combustion is more efficient compared to liquid fuel combustion (IPCC default values for oxidation factor for liquid fuels is 0.990 and for gaseous fuel is 0.995), the project activity would result in better efficiency in hot air generation compared to baseline scenario.

Method 2:
Hence for correct and conservative estimation of savings in LDO due to project activity, PP proposes to estimate LDO savings based on energy values of both BFG and LDO. NCV and quantity of BFG used in the process are part of monitoring plan and are being directly monitored and equivalent amount of LDO displaced is calculated based on these values and quantity of BFG consumed.

The minimum of the above two methods is taken for estimation of emission reduction in the project activity. This shall give the conservative estimates on project estimation due to project activity.

Sample calculations are attached in annex 3 of the document.

Date of determining the baseline: 05.12.2005

Developed by:
Indorama Cement Ltd. (Also a Project participant)
207, Vardhman Chambers
Sector 17, Vashi, Navi Mumbai
Maharashtra
400 705

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:

12/02/2000

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

20 years

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

C.2.1. Renewable crediting period:

-NA-

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

-NA-

C.2.1.2. Length of the first crediting period:

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/09/2006

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:

This comes under the Appendix B of the simplified modalities & procedures for small-scale CDM-project activities under Category IIIB– "***Switching fossil fuels"***

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

The project primarily aims at reducing emissions through displacement of LDO by BFG (Type IIIB) – the monitoring methodology and baseline are selected here as suggested in the document 'Simplified Modalities and Procedures for Small-Scale CDM project activities'

This project proposed to implement following monitoring methodology, this is inline with monitoring guidelines provided in appendix B: IIIB– ***Switching fossil fuels***

D.3 Data to be monitored:

ID number	Data type	Data variable	Data unit	Measured (m), calculated © or estimated (e)	Recording frequency	How will the data be archived? (electronic/ paper)	For how long is archived data to be kept?	Comment
1.1	Q_{LDO}	Quantity of LDO Fuel consumed	KL	Measured	Monthly	Electronic	Credit period + 2	Measured as part of plant operations.
1.2	$COEF_{LDO}$	Coefficient of Emission for LDO	tCO2e/KL	Calculated	Monthly	Electronic	Credit period + 2	Based on NCV, EF and oxidation factor of LDO. EF and oxidation factor are taken as IPCC default values
1.3	Q_{BFG}	Quantity of BFG consumed	m3	Measured	Continuou sly	Electronic	Credit period + 2	Measured from the plant operations; cross checked by Gas Bill received from the steel plant
1.4	$COEF_{BFG}$	Coefficient of emission for BFG	tCO2e/ Nm3	Calculated	Monthly	Electronic	Credit period + 2	Based on NCV, EF and oxidation factor of BFG. EF and oxidation factor are taken as IPCC default values
1.5	NCV_{LDO}	Net calorific value of LDO	Kcal/L	Estimated	Monthly	Electronic	Credit period + 2	Lab test data for LDO
1.6	NCV_{BFG}	Net calorific value of BFG	Kcal/m3	Estimated	Monthly	Electronic	Credit period + 2	Lab test data for BFG
1.7	EF_{LDO}	Emission factor for LDO	tCO2e/TJ	Estimated	Yearly	Electronic	Credit period + 2	IPCC default value
1.8	EF_{BFG}	Emission factor for BFG	tCO2e/ TJ	Estimated	Yearly	Electronic	Credit period + 2	IPCC default value
1.9	Q_{CLNK}	Quantity of clinker produced	Tonne	Measured	Monthly	Electronic	Credit period + 2	Plant operation records
1.10	Q_{SLAG}	Quantity of	Tonne	Measured	Monthly	Electronic	Credit	Plant operation records

		slag produced					period + 2	

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

Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
Table D.3 (ID numbers from 1.2,1.4)	Low	The data is calculated based on other factors being monitored as part of project activity. Detail formulae for calculating these data are part of PDD.
Table D.3 (ID numbers from 1.5-1.6)	Low	The data is based on independent lab test reports. Records of tests conducted on LDO and BFG shall be maintained for the entire crediting period.
Table D.3 (ID numbers from 1.7-1.8)	Low	The data is based on IPCC default values for BFG and LDO.
Table D.3 (ID numbers from 1.1,1.3, 1.9-1.10)	Low	The data is based on plant operation records. Can be cross checked with other documents available in the plant. QA/QC requirements consist of cross- checking these with other internal company report

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:

IRCL is an ISO certified company, and maintains all production/purchase/sales records as per audit guidelines. IRCL has procedures in place for operation and maintenance of the plant machinery, equipments and instruments and it maintains data on maintenance & calibration of the equipments. The equipments used for CDM project are also part of these procedures and document on maintenance and rectification done on all the monitoring equipments are maintained.

Organisational Structure:
A CDM project team is constituted with participation from relevant departments. People are trained on CDM monitoring plan. This team is responsible for data collection and archiving. This team meets periodically to review CDM project activity, check data collected, emissions reduced, etc. On a monthly basis, the monitoring reports are checked and discussed by the team. In case of any irregularity observed by any of the CDM team member, it is informed to the concerned person for necessary actions. On a periodic basis, these reports are forwarded to CDM project director.

CDM Project Director (Plant Head): Overall responsibility for compliance with the CDM monitoring plans.

Site Supervisor: Responsibility for completeness of data, reliability of data (calibration of meters), and monthly report generation

Shift In-charge: Responsibility of data collection

CDM Data Monitoring Plan

Quality Management System:
IRCL has an elaborate quality management system for the plant operations. Monitoring of BFG/LDO operated HAG quality management system will also be made part of this standard QMS.

Data to be monitored:
IRCL monitors data as described in section D3.

Data Collection Frequency:
The frequency for data monitoring is as per the monitoring details in Section D3.

Day to day data collection and record keeping:
Plant data is collected on operation under the supervision of the respective Shift-in-charge and record would be kept in daily logs.

Data Archiving:
Data is archived in electronic/paper form (as per AMS-IIIB) and is kept for crediting period + 2 years.

Calibration/Maintenance of Measuring and Analytical Instruments:
All measuring and analytical instruments are being regularly calibrated. All meters for measurement of calorific value and quantity of fuel being used are to be calibrated every month as per internationally accepted norms. Maintenance is done as per in IRCL's Quality management system procedures.

Training of CDM team personnel:
The CDM team is conversant with CDM concepts and data monitoring plan.

Internal audits of CDM project compliance:
CDM audits are carried out to check the correctness of procedures and data monitored by the internal auditing team entrusted for the work. Report on internal audits done, faults found and corrective action taken shall be maintained and kept for external auditing.

Report generation on monitoring:
After verification of the data and due diligence on corrective ness if required an annual report on monitoring and estimations shall be maintained by the CDM team and record to this effect shall be maintained for verification.

Sustainable Development Indicators Monitoring:
The CDM project activity leads to following improvement sustainable development for the society
- GHG reduction (Monitoring plan elaborated above)
- Employment Generation: IRCL maintains data regarding employees involved in plant construction, plant operations & maintenance.

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

Mr. Francis
Indorama Cement Ltd.
207, Vardhman Chambers
Sector 17, Vashi, Navi Mumbai
Maharashtra - 400 705

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

NA

E.1.1 Selected formulae as provided in appendix B:

NA

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

Applicable

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:

BFG is a waste gas from blast furnace of the steel plant, which other wise is flared from the chimney of blast furnace without any useful purpose inside the steel plant. Project emissions due to the burning of BFG are negated by emissions due to flaring of BFG in the baseline. Hence project emissions due to combustion of BFG are same as that of flaring of equivalent quantity of BFG in chimney of blast furnace of steel plant in the baseline. Due to this reason project emissions on account of BFG combustion have not been taken.

Emissions due to BFG combustion/ flaring = Q_{BFG} * $COEF_{BFG}$

Where
Q_{BFG} = Quantity of BFG consumed in the year y, Nm3
$COEF_{BFG}$ = Coefficient of emission for BFG, tCO2e/ Nm3

$COEF_{BFG} = NCV_{BFG} * EF_{BFG} * OXID_{BFG}$

Where,
NCV_{BFG} = Net calorific value of BFG, kcal/ Nm3
EF_{BFG} = Emission factor for BFG, tCO2e/ kcal, (IPCC default value)
$OXID_{BFG}$ = Oxidation factor for BFG, 0.995 (IPCC default value)

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

Not required as per the methodology adopted.
Ly = 0.

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

Zero.

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:

As per the methodology, the emission baseline is the current emissions of the facility expressed as emissions per unit of output. Emission coefficients for the fuel used by the generating unit before and after the fuel switch are also needed. IPCC default values for emission coefficients may be used.

Method 1:
In the project activity, PP uses BFG to generate hot air, which is used to dry clinker and slag for production of Portland Slag Cement in the plant. Drying is required to bring the level of moisture in clinker and slag to the acceptable limit for grinding (below 0.5% in the final product). Thus, the output from the project activity is dried clinker and dried slag.

In the baseline years (prior to the project activity), LDO had been used in hot air generation. For estimation of baseline emissions, specific LDO consumption has been estimated based on past data for unit production of dry slag and unit production of dry clinker (Specific LDO consumption per unit of dry slag and per unit of clinker vary due to their different moisture levels).

Formulae used for estimation of specific LDO consumption:

$$BE_y = (Q_{SLAG} * SC_{LDO,SLAG} + Q_{CLNK} * SC_{LDO,CLNK}) * COEF_{LDO} - (Q_{LDO} * COEF_{LDO}) \qquad ----- (1)$$

Where;
BE_y=Baseline emissions in the year y, tCO2e/y
Q_{SLAG} = Quantity of slag produced in year y, tonne
$SC_{LDO, SLAG}$ = Specific LDO consumption in slag production in baseline, KL/ tonne of slag
Q_{CLNK} = Quantity of clinker produced in year y, tonne
$SC_{LDO, CLNK}$ = Specific LDO consumption in clinker production in baseline, KL/ tonne of clinker
Q_{LDO} = Total quantity of LDO consumed in project year (for slag and clinker drying), KL
$COEF_{LDO}$ =Carbon emission factor of LDO, tCO2e/KL

$$COEF_{LDO} = NCV_{LDO} * K * OXID * EF_{LDO} / 1000 / 1000$$

Where;
$COEF_{LDO}$=Carbon emission factor of LDO, tCO2e/KL
NCV_{LDO}= Net Calorific value of LDO, kcal/L
K=Conversion factor = 4.187, kJ/kcal
OXID= Oxidation factor for LDO, 0.990 (IPCC default)
EF_{LDO}=Emission factor for LDO, tCO2e/ TJ, (IPCC default)

$$SC_{LDO, SLAG} = Q_{LDO, SLAG, BSL} / Q_{SLAG, BSL}$$

Where;
$Q_{LDO, SLAG, BSL}$ = Quantity of LDO consumption in slag production in baseline, KL
$Q_{SLAG, BSL}$ = Quantity of slag produced in baseline, tonne

$$SC_{LDO, CLNK} = Q_{LDO, CLNK, BSL} / Q_{CLNK, BSL}$$

Where,

$Q_{LDO, CLNK, BSL}$ = Quantity of LDO consumption in clinker production in baseline, KL

$Q_{CLNK, BSL}$ = Quantity of clinker produced in baseline, tonne

However, the moisture level in Slag and clinker may vary at different times (variations are more in case of slag). Due to this variation in moisture levels, LDO consumption per unit of dried slag and dried clinker may also vary (unlike power generation or steam generation where it can be estimated very correctly for per unit of power or energy output). So, emission baseline in terms of per unit of output (i.e. dried clinker and dried slag) may not always give the most conservative estimate of emission reduction in the project activity. Also, due to the fact that gaseous fuel combustion is more efficient compared to liquid fuel combustion (IPCC default values for oxidation factor for liquid fuels is 0.990 and for gaseous fuel is 0.995), the project activity would result in better efficiency in hot air generation compared to baseline scenario.

Method 2:

Hence for correct and conservative estimation of savings in LDO due to project activity, PP proposes to estimate LDO savings based on energy values of both BFG and LDO. NCV and quantity of BFG used in the process are part of monitoring plan and are being directly monitored and equivalent amount of LDO displaced is calculated based on these values and quantity of BFG consumed.

$$BE_y = (NCV_{BFG} / NCV_{LDO} * Q_{BFG} * COEF_{LDO}) / 1000 \quad \text{------ (2)}$$

Where;

BE_y=Baseline emissions in the year y, tCO2e/y

NCV_{LDO}= Net Calorific value of LDO, kcal/L

NCV_{BFG}=Net Calorific value of BFG, kcal/Nm3

Q_{BFG}= Quantity of BFG utilized in the year y, Nm3

$COEF_{LDO}$=Carbon emission factor of LDO, tCO2e/KL

$$COEF_{LDO} = NCV_{LDO} * K * OXID * EF_{LDO} / 1000 / 1000$$

Where;

$COEF_{LDO}$=Carbon emission factor of LDO, tCO2e/KL

NCV_{LDO}= Net Calorific value of LDO, kcal/L

K=Conversion factor; kJ/kcal, 4.187

OXID= Oxidation factor for LDO, 0.990

EF_{LDO}=Emission factor for LDO, tCO2e/ TJ

The minimum of Eq. 1 & Eq. 2 as above is taken for estimation of emission reduction in the project activity. This shall give the conservative estimates on project estimation due to project activity.

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:

$$ER_y = BE_y - PE_y - L_y$$

ER_y = Emission Reduction in year y

BE_y = Emissions in baseline scenario in year y

PE_y = Emissions in project scenario in year y
L_y = Leakages in project activity in year y

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

SN	Operating Years	Baseline Emissions (tCO2)	Project Emissions in Sources (tCO2)	Leakages (tCO2)	CO2 Emission Reductions (tCO2)
1.	2006-2007	10600	0	0	10600
2.	2007- 2008	10600	0	0	10600
3.	2008- 2009	10600	0	0	10600
4.	2009- 2010	10600	0	0	10600
5.	2010- 2011	10600	0	0	10600
6.	2011- 2012	10600	0	0	10600
7.	2012- 2013	10600	0	0	10600
8.	2013- 2014	10600	0	0	10600
9.	2014- 2015	10600	0	0	10600
10.	2015- 2016	10600	0	0	10600

SECTION F.: Environmental impacts:

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

The project activity does not require any EIA to be done. However IRCL has conducted an internal assessment of the impacts that the project activity would have had on the environment.

The assessment was carried out on various aspects of environment i.e. air, water, soil. The study shows that the project activity has only positive impacts on environment in lesser quantity of GHGs emitted. The gas is conveyed from the steel plant to IRCL unit via pipes and there is no chance of any leakages.

Activities during construction & operation did not affect the bio-diversity in the region. There is no impact on soil, water quality, and forest cover due to the power project.

SECTION G. Stakeholders' comments:

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

IRCL has called for stakeholders' comments on the project activity at various levels through letters to gram panchayat and District Magistrate office. IRCL has arranged a meeting with people from local community to discuss about the project activity. The meeting started with the welcome note and thereafter they were briefed about IRCL and the project activity. Comments/suggestions were invited from the participants.

Major stakeholders to the project activity are following -

- Local Community
- Gram Panchayat
- District Authority Office
- BFG supplying company

A meeting was held on 21.01.2006 with Sarpanch and local people from village Gadab. Mr. Vijay Patil – Sarpanch and Ms. Suchita S Mokal – Dy. Sarpanch was present in the meeting. Mr. P. S. Gawli, Mr. S. V. Jadhav and Mr. R. K. Dubey represented IRCL.

The meeting started with a welcome note and brief about the company and the project. The plant people explained them about carbon credit concept and utilisation of blast furnace gas in the hot air generator. They participated enthusiastically and some queries which are listed as below –

Q1: What are the positives of such projects?
Ans: Process will help in conservation of natural resources like fossil fuels and reducing pollution.

Q2: What are the negatives of project?
Ans: No negative impact has been envisaged. BFG is flared as per the Government rules in India and so, project does not generate additional environmental load.

Q3: While implementing the project, could IRCL do something which benefits the local people?
Ans: The project activity has created employment for the people.

Q4: How do they find interaction with IRCL people?
Ans: It was stated that it was an educative sessions for them.

IRCL invited the people to further give suggestion and they asked the company to hold such interactive and educating sessions time to time.

G.2. Summary of the comments received:

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

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

There was no negative comment on the project activity from the stakeholders, hence no corrective action needed.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Indorama Cement Ltd.
Street/P.O.Box:	207
Building:	Vardhman Chambers
City:	Sector 17, Vashi, Navi Mumbai
State/Region:	Maharashtra
Postfix/ZIP:	400 705
Country:	India
Telephone:	91 22 2789 6004/ 07
FAX:	91 22 2789 6010/6020
E-Mail:	irclvashi@indorama.co.in
URL:	www.indorama.co.in
Represented by:	
Title:	VP-Finance
Salutation:	Mr.
Last Name:	Sharma
Middle Name:	K
First Name:	B
Department:	Finance
Mobile:	91 98190 19113
Direct FAX:	91 22278 96020
Direct tel:	91-22-27896004/5/6/7
Personal E-Mail:	bsharma@indorama.co.in

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No Public Funding available for this project.

Annex 3

Estimation of Baseline Emission

In the absence of project activity, emissions in the baseline would generate due to combustion of LDO for thermal energy generation. In the project activity, IRCL is using BFG as fuel displacing use of the LDO.

Sample calculation for baseline emission based on formulae described in section E of this document is as follows:

Estimation of LDO baseline in slag and clinker drying (April 1999- September 2000)

Method 1:
Quantity of slag production = 64817 tonne
Quantity of clinker production = 567873 tonne
LDO consumption in slag drying = 1026065 KL
LDO consumption in clinker drying = 3289467 KL
Specific LDO consumption in slag drying = 15.83 L/ tonne of slag
Specific LDO consumption in clinker drying = 5.79 L/ tonne of clinker

Estimation of Coefficient of Emission (COEF) for LDO

Emission Factor of LDO = 74.1 tCO_2e/ TJ
Conversion factor (kcal to kJ) = 4.187
Oxidation factor for LDO = 0.99
$COEF_{LDO}$ = 74.1 X 4.187 X 0.99 X 9000/ 1000/1000
= 2.7644 tCO_2e/ KL

Estimation of baseline emissions in Method 1 (April 2004- March 2005)
Quantity of Slag Produced = 345047 tonne
Quantity of Clinker Produced = 280499 tonne
Quantity of LDO consumed in slag & clinker drying in project year = 662.37 KL

= (345047 * 15.83 + 280499 * 5.79)/ 1000 * 2.7644 – (662.37 * 2.7644)
= 17760 tCO_2e/ annum

Method 2:
In the absence of project activity, emissions in the baseline would generate due to combustion of LDO for thermal energy generation. In the project activity, IRCL is using BFG as fuel displacing use of the LDO.

Sample calculation for baseline emission based on formulae described in section E of this document is as follows:

Estimation of LDO savings due to BFG use in a year

Quantity of BFG consumption in the plant = 49302734 Nm3
Net calorific value of BFG = 700 kcal/Nm3

Net calorific value of LDO = 9000 kcal/l
Savings in LDO consumption due to BFG combustion = 49302734 X 1000 X 1000 X 700 / 9000
= 3834657 L of LDO

Estimation of Coefficient of Emission (COEF) for LDO
Coefficient of Emission, LDO
Emission Factor of LDO = 74.1 tCO_2e/ TJ
Conversion factor (kcal to kJ) = 4.187
Oxidation factor for LDO = 0.99
$COEF_{LDO}$ = 74.1 X 4.187 X 0.99 X 9000/ 1000/1000
= 2.7644 tCO_2e/ KL

Baseline Emissions
BEy = 3834657 X 2.7644 / 1000
= 10600 tCO_2e/ annum

Hence, baseline emissions is the minimum of the two estimated as above-

BEy = Min (BEy, method 1, BEy, method 2)
= Min (17760, 10600)
= 10600 tCO_2e/ annum

Annex 4

Proof for CDM consideration

INDORAMA

ISO 9001 : 2000 COMPANY

Extract of Minutes of the Meeting of the Board of Directors of Indorama Cement Limited held at 11.00 a.m. on Saturday, 12th February, 2000 at 207, Vardhaman Chambers, Sector 17, Vashi, Navi Mumbai – 400 705.

B F Gas project

Chairman informed the Board that they are working on the project of tapping Blast Furnace Gas from M/s Ispat Metallics India Ltd. (IMIL) for substitution in place of LDO for the operation of plant. The matter was discussed in the meeting and the Board is of the opinion that the use of BFG from IMIL would need investments in equipments/ piping etc at the site of Hot Air Generator (HAG). Also, HAG would need additional arrangements to use BFG along with LDO in dual mode. There are also some technological issues vis-à-vis BFG availability and quality, which is not under company's control. The project carries inherent investment risk due to these reasons. However, considering Clean Development Mechanism under Kyoto protocol backed revenue and its positive impact on the environment, the board decides to go ahead with the project of substituting BF Gas in place of LDO to the extent possible by setting up dual firing system. It was further decided that necessary actions should be taken in this regard by the Executive Director in consultation with company's technical people.

CERTIFIED TRUE COPY

For INDORAMA CEMENT LTD.

Company Secretary

INDORAMA CEMENT LIMITED
207, Vardhaman Chambers, Sector - 17,
Vashi, Navi Mumbai - 400 705, India.

Works :
Vill. Khar Karavi, P. O. Gadab,
Taluka-Pen, Dist. Raigad - 402 107.

Annex 5

Recent BFG TEST REPORT

SGS

TEST REPORT

Report No. : CA:GL:6120016267 **DATE 13.12.200**

JOE No: 612107597 Control No. 6125016377

SAMPLE DRAWN BY SGS INDIA PVT. LTD.

SAMPLE IDENTIFIED	B.F. GAS
COMPANY NAME	M/S. INDORAMA CEMENT LIMITED.
ADDRESS	207, VARDHAMAN CHAMBER, SECTOR-17 VASHI, NAVI MUMBAI – 400 705
ON A/C OF	ENVI, SGS – THANE.
SAMPLING DESCRIPTION	SAMPLE RECEIVED IN A SEALED BLADDER
SAMPLING RECD ON	13.12.2006
TEST START DATE	13.12.2006
TEST END DATE	13.12.2006

SL.NO.	PARAMETERS	RESULTS
1.	CARBON MONOXIDE (CO)	29.4%
2.	CARBON DI OXIDE (CO_2)	<0.2%
3.	HIDROGEN (H_2)	0.8%
4.	OXYGEN (O_2)	19%
5	CALORIFIC VALUE	920.52 K cal/Nm^3

*****End of Report*****

A. Dutta
Checked by

Dutta
Chemist cum QAL

For and on behalf of
SGS India Private Ltd.

Dr. N. Ghosh
Asst. Manager - Laboratory

Page 1 of 1

Recent LDO TEST REPORT

SGS

TEST REPORT

Sample No. : TH:GL:6130002215 **DATE : 05/12/2006**

JOE No. : 613101076 Report No.:6135002228

SAMPLE NOT DRAWN BY SGS INDIA PRIVATE LTD.

SAMPLE SUBMITTED AND IDENTIFIED BY SUPPLIER AS : LIGHT DIESEL OIL

COMPANY NAME	**INDORAMA CEMENT LIMITED.**
ADDRESS	207, VARDHAMAN CHAMBERS,, SECTOR 17, VASHI,
CITY	NAVI MUMBAI-400705
SAMPLING METHOD	N.A.
SAMPLE DESCRIPTION	SAMPLE OF LDO
SAMPLE CONDITION	UNSEALED PLASTIC BOTTLE
SAMPLE QTY.	500 ML.
LETTER DATE	28-11-2006.
MARKS	UNMARKED
SAMPLE RECD ON	04-12-2006
TEST START DATE	05/12/2006
TEST END DATE	05/12/2006

TESTS	PROTOCOL	RESULT
GROSS CALORIFIC VALUE	IS 1448:PART 7 :2004	10830 Cal./g.

***** End of Report ****

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Page 1 of 1

SGS India Pvt. Ltd. Laboratory, A-77, SGS House,Wagle Ind. Area,Near Pipeline, Thane Phone : 5821335,0777,03667 Fax : 5823636
Regd & Corp. Off : SGS House, 4B, A.S. Marg, Vikhroli (West), Mumbai-400083. Tel : (022) 25798421 to 28 Fax : (022) 25798431 to 35 www.sgs.com

Member of the SGS Group

Annex 6

Plant production and LDO consumption in the baseline prior to the project activity

Fuel consumption in slag drying

Month-Year	Slag Production	LDO Consumed	
	MT	Litres	L/MT
Apr-99	0	0.0	0.00
May-99	0	0.0	0.00
Jun-99	0	0.0	0.00
Jul-99	84	1323.0	15.75
Aug-99	2407	78494.0	32.61
Sep-99	0	0.0	0.00
Oct-99	670	24360.0	36.36
Nov-99	1345	32432.0	24.11
Dec-99	1013	18139.0	17.91
Jan-00	2780	32305.0	11.62
Feb-00	2950	44178.0	14.98
Mar-00	4556	49739.0	10.92
Total	**15805**	**280970**	**17.78**

Month-Year	Slag Production	LDO Consumed	
	MT	Litres	L/MT
Apr-00	6234	77943	12.50
May-00	8699	97348	11.19
Jun-00	6715	91785	13.67
Jul-00	7467	133092	17.82
Aug-00	10548	177773	16.85
Sep-00	9349	167154	17.88
Total	**49012**	**745095**	**15.20**

Fuel consumption in clinker grinding

Month-year	Clinker Production	LDO Consumed	
	MT	Litres	L/MT
Apr-99	0	0	0.00
May-99	0	0	0.00
Jun-99	7205	62733	8.71
Jul-99	7500	60084	8.01
Aug-99	12539	112316	8.96
Sep-99	10191	57644	5.66
Oct-99	22187	136322	6.14
Nov-99	24753	131279	5.30
Dec-99	24355	121214	4.98
Jan-00	22566	141067	6.25
Feb-00	21030	108221	5.15
Mar-00	23869	120007	5.03
Total	**176195**	**1050887**	**5.96**

Apr-00	17038	80825	4.74
May-00	19136	96985	5.07
Jun-00	15107	84536	5.60
Jul-00	12546	85901	6.85
Aug-00	18410	110563	6.01
Sep-00	16673	107095	6.42
Total	**391678**	**2238580**	**5.72**

Annex 7

Comparison of BFG cost to PP and benefit accruing through equivalent CER sale

Parameter	Value	Source
Cost of BFG to PP	Rs. 0.31/ Nm3 of BFG	Gas Invoice from Steel Plant to PP; dated 23/11/2005 (attached)
Benefits from CER sale CER generation from BFG use NCV of BFG = 700 kcal/ Nm3 NCV of LDO = 9000 kcal/ L LDO saving = 700/ 9000 L/ Nm3 of BFG Emission Factor of LDO = 2.76[#] tCO2e/ KL Emission Reduction = 700/ 9000 * 2.76/ 1000 tCO2e/ Nm3 of BFG = 0.000215 tCO2e/ Nm3 Revenue from CER (@10 Euro at Rs. 56/ Euro) = 0.000215 *10 * 56 = Rs. 0.12/ Nm3 of BFG	Rs. 0.12/ Nm3 of BFG*	# Based on IPCC value on emission factor and oxidation factor of LDO.

*The revenue generation from the CER sale on account of BFG overuse (above that is required for useful purpose in drying of clinker and slag to the desired levels) is much below the cost of BFG to PP. Hence possibility of overuse (above that is adequately required) is ruled out.

ISPAT INDUSTRIES LIMITED (BF-DIVISION)

Factory: Geetapuram, Dharamtar Dolvi, Taluk [illegible], Dist Raigad, PIN - 402 107 (Maharashtra) Ph. (02143) 277501 / 4, Fax : 02143 - 277533

TAX INVOICE / INVOICE — Cen. Ex. Reg. NO. - AAACI 625 [illegible] XM 001

Invoice for removal for Excisable goods from factory or warehouse on payment of duty (Rule 11 of Central Excise Rules 2002)

ORIGINAL FOR BUYER
(Stock Transfer / Captive use / related Person / Independent buyer etc.)

Off. Address : Casablanca, Plot No.-45, Sec No. II, C.B.D. Belapur-400 614., Ph.: 27577951 / 61, Fax : 27577971 / 2 / 3

Range - PEN - I
Division - KHOPOLI
Commissionerate - RAIGAD
KENDRIYA UTPAD SHULK BHAVAN Plot No. 1, Sec. 17, Khandeshwar, Panvel, Navi Mumbai - PIN - 410 206.

PREPRINTED INVOICE NO. 0000255

Authenticated

SAP INV. NO. : 3550000255
BILL DOC NO. : 1111000245
TIN NO.
DATE 23.11.2005

Sold To: INDO RAMA CEMENT LTD.
207, VARDHAMAN CHAMBERS, SEC.17,
VASHI
NAVI MUMBAI - 400705
Maharashtra

Delivered at: INDO RAMA CEMENT LTD.
VILLAGE - KHAR KARAVI PO WADKHAL,
TALUKA PEN
DIST: RAIGAD -
Maharashtra ECC NO. AAACI2389DXM001

D. O. No. : 23001097 Date : 31.10.2005
Purchase Order No.: 13000014 Date : 05.05.2003
RR / LR No. : 0000000000 Date 23.11.2005
Mode of Transport :
Veh. Reg. No. :
Transporter's Name
Terms of Payment : 100% Advance
Bank & Branch :
L. C. No. Date
Cen. Ex. Reg. No. & ECC No. AAACI 6293 EXM 001
P.L.A. No. AAACI 6293 EXM 001
Party's TIN No. :
Party's C.S.T. No. / Date . 402107/C/48 DTD: 27.01.1997
Party's L.S.T. No. / Date : 402107/S/370 DTD: 23.01.1997
C.S.T. REGN. NO. & DATE 402107-C-23 DT. 1-4-96
M.S.T. REGN. NO. & DATE 402107-S-175 DT.1-4-96

Name of Excisable Commodity: Blast furnace Top Gas-BF Gas
Tariff Heading No.: 2803 00 90
Rate of Duty: 0.00 Cess 2.00
Exemption Notif No.
Tariff Rate

Description & Specification of Goods	Units of Qty.	Total Qty. M.T.	Rate Rs.	Assessable Value
Blast furnace Top Gas-BF Gas Despatched under Not.No 23/2004 C.E Dt.09.07.2004	NM3	77,131.00	0.31	23,910.61

Total excise duty payable : Rs. (in words)
RUPEES ZERO ONLY

Monthly Payment of Excise Duty as per Rule 4 of Excise Rules 2002 — Amount 0.00

Date & Time of issue of invoice 23.11.2005 09:38:57
Date & Time of removal 23.11.2005 09:39:53

Add Freight	0.00
Total Value	23,910.61
Add Excise Duty	0.00
Total Cess	0.00
Add / MST/CST	23,910.61
Grand Total	23,910.61

Grand Total (in words)
RUPEES TWENTY-THREE THOUSAND NINE HUNDRED TEN AND PAISE SIXTY-ONE ONLY

Excise Declaration :
Certified that particulars given above are true and correct and the amount indicated represents the price actually charged and that there is no flow of additional consideration directly or indirectly from the buyer.

"I / WE HEREBY DECLARE THAT SALE OF GOODS EVIDENCED BY THIS INVOICE IS EXEMPT FROM THE WHOLE OF SALES TAX IN MY / OUR HANDS ON ACCOUNT OF THE CERTIFICATE OF ENTITLEMENT BEARING NO. 402107-S-E-3/MEGA - 1478 DULY GRANTED TO ME / US AND AS SUCH MY / OUR IMMEDIATE PURCHASER SHALL NOT BE ENTITLED TO CLAIM ANY SET OFF IN RESPECT OF THIS TRANSACTION UNDER ANY PROVISION OF MAHARASHTRA VALUE ADDED TAX ACT, 2002 OR THE RULES FRAMED THERE UNDER AND THAT THE TRANSACTION SHALL BE ACCOUNTED FOR IN THE TURNOVER OF SALES WHILE FILING MY RETURN"

For Ispat Industries Limited

Signature of Registered Person or his Authorised Agent

LOGIS / F / 07 / 01 **Registered Office :** Geetapuram, Dharamtar, Dolvi, Taluka - Pen, Dist Raigad PIN - 402 107. (Maharshtra)

Annex 8

Problems faced with BFG use

Details of problems faced in using of B.F.Gas during 2001-2002

Month	B.F.Gas fluctuation		Low pressure		Non availability		Poor burning	
	Freq	Hrs.	Freq	Hrs.	Freq	Hrs.	Freq	Hrs.
Apr. 2001	--	--	1	0.20	1	14.62	--	--
May. 2001	--	--	1	0.08	--	--	--	--
June 2001	--	--	1	0.08	--	--	--	--
July 2000	--	--	--	--	2	21.92	--	--
Aug. 2001	--	--	6	0.60	1	7.53	--	--
Sep. 2001	--	--	5	0.57	1	10.55	--	--
Oct. 2001	1	0.17	--	--	--	--	--	--
Nov. 2001	--	--	--	--	3	14.50	--	--
Dec. 2001	1	0.43	--	--	3	17.72	--	--
Jan. 2002	1	0.17	--	--	--	--	--	--
Feb. 2002	--	--	--	--	--	--	--	--
Mar. 2002	16	0.9	--	--	--	--	--	--
Total	19	1.67	14	1.53	11	**86.84**	--	--

Details of problems faced in using of B.F.Gas during 2002-2003

Month	B.F.Gas fluctuation		Low pressure		Non availability		Poor burning	
	Freq	Hrs.	Freq	Hrs.	Freq	Hrs.	Freq	Hrs.
Apr. 2002	17	1.27	-	-	1	8.38	-	-
May. 2002	22	1.92	-	-	1	4.08	-	-
June 2002	11	0.78	-	-	-	-	-	-
July 2002	14	1.27	-	-	-	-	-	-
Aug. 2002	5	0.25	-	-	4	47.96	-	-
Sep. 2002	20	2.85	-	-	3	34.8	-	-
Oct. 2002	37	3.33	-	-	3	29.45	-	-
Nov. 2002	19	1.92	-	-	1	0.83	-	-
Dec. 2002	7	0.42	-	-	1	28.48	-	-
Jan. 2003	43	3.46	-	-	1	9.47	-	-
Feb. 2003	118	9.65	-	-	-	-	-	-
Mar. 2003	71	6.05	-	-	1	11.0	-	-
Total	384	33.17	-	-	16	**174.45**	-	-

Details of problems faced in using of B.F.Gas during 2003-2004

Month	B.F.Gas fluctuation		Low pressure		Non availability		Poor burning	
	Freq	Hrs.	Freq	Hrs.	Freq	Hrs.	Freq	Hrs.
Apr. 2003	5	0.78	-	-	-	-	-	-
May. 2003	-	-	-	-	-	-	-	-
June 2003	2	0.46	-	-	6	107.27	-	-
July 2003	1	0.15	-	-	4	51.2	-	-
Aug. 2003	3	0.36	-	-	2	13.67	-	-
Sep. 2003	2	0.22	-	-	6	21.1	-	-
Oct. 2003	10	1.24	3	0.47	1	6.22	-	-
Nov. 2003	19	2.4	2	0.37	3	24.05	16	2.27
Dec. 2003	50	6.57	3	0.38	6	43.75	-	-
Jan. 2004	15	1.65	19	2.32	-	-	-	-
Feb. 2004	20	3.15	1	0.11	-	-	-	-
Mar. 2004	18	2.71	2	0.43	-	-	-	-
Total	145	19.69	30	4.08	28	**267.26**	16	2.27

Details of problems faced in using of B.F.Gas during 2004-2005

Month	B.F.Gas fluctuation		Low pressure		Non availability		Poor burning	
	Freq	Hrs.	Freq	Hrs.	Freq	Hrs.	Freq	Hrs.
Apr. 2004	6	0.97	-	-	-	-	-	-
May. 2004	5	0.53	1	0.25	-	-	-	-
June 2004	-	-	-	-	2	11.93	-	-
July 2004	6	1.41	-	-	2	19.47	-	-
Aug. 2004	1	0.10	-	-	1	11.52	-	-
Sep. 2004	2	0.17	-	-	-	-	-	-
Oct. 2004	4	0.33	-	-	-	-	-	-
Nov. 2004	6	1.10	-	-	-	-	-	-
Dec. 2004	2	0.45	-	-	-	-	-	-
Jan. 2005	1	0.07	1	0.12	-	-	-	-
Feb. 2005	-	-	2	0.18	-	-	-	-
Mar. 2005	-	-	-	-	-	-	-	-
Total	33	5.13	4	0.55	5	**42.92**		

Details of problems faced in using B.F. Gas during 2005-2006

Month	B.F. Gas fluctuation		Low pressure		Non availability		Poor burning	
	Freq	Hrs.	Freq	Hrs.	Freq	Hrs.	Freq	Hrs.
Apr. 2005	1	0.17	-	-	1	2.10	-	-
May. 2005	-	-	-	-	-	-	-	-
June 2005	-	-	-	-	-	-	-	-
July 2005	2	0.37	-	-	10	84.44	-	-
Aug. 2005	-	-	-	-	1	14.50	-	-
Sep. 2005	-	-	-	-	7	277.11	-	-
Oct. 2005	-	-	1	3.33	9	57.65	-	-
Nov. 2005	-	-	-	-	3	22.25	-	-
Dec. 2005	2	0.59			6	31.72	-	-
Total	5	1.13	1	3.33	37	**489.77**	-	-

Annex 9

Estimation of Emission Reduction based on AMS-III.B

The emission reduction achieved by the project activity will be calculated as the difference between the baseline emissions and the project emissions.

Based on the past performance of Hot Air Generator in the baseline for slag and clinker drying, following is the rate of LDO consumption –

Output – Raw Material	**Specific LDO consumption**		**Average Value taken for estimation of baseline emissions**
Month-Year --->	April 1999-March 2000	April 2000-September 2000	April 1999- September 2000
Slag	17.78 L/ tonne	15.20 L/ tonne	15.83 L/ tonne
Clinker	5.96 L/ tonne	5.72 L/ tonne	5.79 L/ tonne

Estimation for baseline emissions –

Parameter	**Value**	**Source**
Emission Factor – LDO	20.2 tC/ TJ	IPCC default for LDO
NCV – LDO	9000 kcal/ L	Lab test value
Oxidation Factor	0.99	IPCC default for LDO
Coefficient of Emission - LDO	2.764 tCO2e/ KL	Calculated

Raw Material	**Value**	**LDO consumption – Baseline**	**Baseline Emissions**
Quantity of Clinker produced (2004-05)	280499 tonne	280499 *5.79/ 1000 = 1624 KL	1624* 2.764 = 4489 tCO2e
Quantity of Slag produced (2004-05)	345047 tonne	345047 * 15.83/ 1000 =5462 KL	5462*2.764 = 15099 tCO2e
Quantity of LDO consumed (for both slag and clinker drying) (2004-05)	662.37 KL	662.37 KL	662.37 *2.764 = 1831 tCO2e
Baseline Emissions			17760 tCO2e/ annum*

*The emission reduction estimated based on specific fuel consumption in the baseline for unit output (dry slag and dry clinker) is more than that estimated based on energy values of LDO and BFG and quantity of BFG used (10600 tCO2e). Hence estimation of emission reduction using the energy values is more appropriate and more conservative.