SECTION D. Application of a monitoring methodology and plan

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

Title: "**Consolidated baseline methodology for waste gas and/or heat and/or pressure for power generation**"
Reference: Approved consolidated monitoring methodology ACM0004 / Version 02, Sectoral Scope: 01, 03 March 2006.

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

The approved consolidated monitoring methodology is designed to be used in conjunction with the approved consolidated baseline methodology. The applicability conditions for the monitoring methodology are identical to that of the baseline methodology. Please refer to section B.1.1 for a detailed discussion. Hence it is justified to adopt the approved consolidated monitoring methodology for the project activity.

The flue gases released from the plant is having a considerable waste heat, which is used for power generation. The proposed power project is a Waste heat recovery based power project. Thus, the project displaces the use of any other fossil fuel at the regional grid for the equivalent amount of electricity generation at thermal power station, which can liberate pollutant to the environment.

According to the ACM0004 the applicability criteria are the same as for the Baseline Methodology.

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 type	Data variable	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)	For how long archived data to be kept?	Comment
1. Q_1	Quantitative	Quantity of Diesel	tonnes	m	Monthly	100%	Paper / Electronic	Credit periods +2 years	Purchased Invoices
2. NCV_1	Quantitative	Net calorific Value of Diesel	TJ/tonne	m	Monthly	Random	Paper	Credit periods +2 years	Will be taken from third party testing report or country specific data.
3. EF_1	Quantitative	Carbon emission factor for HSD	tC/TJ	IPCC defaults	--	--	--	Credit periods +2 years	In the absence of India specific values, IPCC recommended values have been used.

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

The project would not result in any emissions due to firing of any auxiliary fossil fuel. However, for emergencies such as non availability of waste heat or in absence of grid electricity for back start of the power plant, DG sets will be used. Hence emissions from usage of Diesel in DG sets during emergencies would be recorded and subtracted from total emission reduction achieved from the project.

Project emissions are given as: $PE\ y = \sum Qi \times NCVi \times EFi \times 44/12 \times OXIDi$
Where:

PEy =Project emissions in year y (tCO_2)

Qi =Mass or volume unit of fuel i consumed (t or m^3)
NCVi =Net calorific value per mass or volume unit of fuel i (TJ/t or kcal/kg)
EFi =Carbon emissions factor per unit of energy of the fuel i
OXIDi =Oxidation factor of the fuel i (%); (99 %,)

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 type	Data variable	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long archived data to be kept?	Comment
4. EG_{GEN}	Quantitative	Total Electricity Generated	MWh/yr	Measured (m)	Continously	100%	Electronic/Paper	Credit period +2 years	The data is measured by meters at the power plant control room. Manager in-charge is responsible for regular calibration of meter.
5. EG_{AUX}	Quantitative	Auxiliary consumption of electricity	MWh/yr	Measured (m)	Daily	100%	Electronic/Paper	Credit period +2 years	Same as above.
6. EG_y	Quantitative	Net Electricity supplied for inhouse consumption and elcetricty export to the state electricity board	MWh/yr	C	Daily	100%	Paper	Credit period +2 years	Calculated from the above measured parameters (4– 5).

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 type	Data variable	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long archived data to be kept?	Comment
~~12. EF_y~~	~~Quantitative~~	~~CM CO_2 emission factor for relevant grid~~	~~tCO_2/MWh~~	~~C~~	~~Yearly~~	~~100%~~	~~Electronic~~	~~Credit period +2 years~~	~~Calculated as weighted average of OM and BM.~~
~~13. $EF_{OM,y}$~~	~~Quantitative~~	~~OM emission factor for relevant grid~~	~~tCO_2/MWh~~	~~C~~	~~Yearly~~	~~100%~~	~~Electronic~~	~~Credit period +2 years~~	~~Calculated as per ACM0002.~~
~~14. $EF_{BM,y}$~~	~~Quantitative~~	~~BM emission factor for relevant grid~~	~~tCO_2/MWh~~	~~C~~	~~Yearly~~	~~100%~~	~~Electronic~~	~~Credit period +2 years~~	~~Same as above.~~
~~15. $F_{i,j,y}$~~	~~Quantitative~~	~~Amount of fossil fuel consumed by each power source / plant in the relevant grid~~	~~T or m3/yr~~	~~E~~	~~Yearly~~	~~100%~~	~~Electronic~~	~~Credit period +2 years~~	~~Used for calculating emission coefficients in OM and BM.~~
~~16. $COEF_{i,k}$~~	~~Quantitative~~	~~CO_2 emission coefficient for each fossil fuel type i~~	~~tCO2/t or m3~~	~~E~~	~~Yearly~~	~~100%~~	~~Electronic~~	~~Credit period +2 years~~	~~Same as above.~~
~~17. $GEN_{i,y}$~~	~~Quantitative~~	~~Electricity generation of each power source / plant in relevant grid~~	~~MWh/yr~~	~~e~~	~~Yearly~~	~~100%~~	~~Electronic~~	~~Credit period +2 years~~	~~Same as above.~~

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

A combined margin approach has been used to calculate the baseline emissions for the various electricity grids considered. The emission factor is calculated as follows:

$$BE_y = EG_y * EF_y$$

$$EF_y = (EF_{OM,y} + EF_{BM,y}) / 2$$

The Simple OM emission factor ($EF_{OM,simple,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh or kg CO_2equ/kWh) of all generating sources serving the system, not including low-operating cost and must-run power plants:

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

where *Fi ,j, y* is the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year(s) *y*,
j refers to the power sources delivering electricity to the grid, not including low-operating cost and must run power plants, and including imports to the grid,
COEFi,j y is the CO_2 emission coefficient of fuel *i* (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in year(s) *y*, and
GENj,y is the electricity (MWh) delivered to the grid by source *j*.

The CO_2 emission coefficient *COEFi* is obtained as
$COEF_i = NCV_i \times EF_{CO2,i} \times OXID_i$
Where:
NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel *i*,
$OXID_i$ is the oxidation factor of the fuel (see page 1.29 in the 1996 Revised IPCC Guidelines for default values),
$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i*.

The simple OM for Western Regional Grid has been calculated ex-ante using a 3-year power generation weighted average, based on the most recent statistics available at the time of PDD submission. The Operating Margin calculations for ACM0002, the emissions factor is calculated as the full generation-weighted

average OM of 2002-2003, 2003-2004 and 2004-2005. The *EF_OM* is calculated as 1.114 tCO_2e/MWh or kg CO_2equ/kWh and will remain fixed during the crediting period.

The Build Margin emission factor (*EFBM,y*) as the generation-weighted average emission factor (tCO2/MWh) of a sample of power plants *m*, as follows:

As per the methodology ACM0002, the **Build Margin** is the weighted average emissions (in kgCO_2e/kWh) of recent capacity additions to the system, which capacity additions are defined as the greater (in MWh) of most recent 20% of existing plants or the 5 most recent plants. Using the available data in the Western ~~Southern~~ Regional Grid from the CEA General Review, the most recent 20% of additional units is chosen as this would represent a larger, more representative of annual generation. It can be determined that additions since 1998-2005 were representing more than 20% of the current generating capacity. Therefore the additions between 1995 and 2005 are chosen to represent the build margin.

The generation-weighted average emission factor (tCO_2/MWh or kg CO_2equ/kWh) of a sample of power plants *m*, as follows:

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

Where *Fi,m,y*, *COEFi,m* and *GENm,y* are analogous to the variables described for the simple OM method above for plants *m*.

The *EF_BM* is calculated ex-ante as 0.743 tCO_2e/MWh and will remain fixed during the crediting period.

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

Not Applicable

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

NA

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

NA

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

Not Applicable

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

NA

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.)

The emission reduction ($\mathbf{ER_y}$) by the project activity during a given year ***y*** is the difference between the baseline emissions though substitution of electricity generation with fossil fuels ($\mathbf{BE_y}$) and project emissions ($\mathbf{PE_y}$), as follows:

$$\mathbf{ER_y = BE_y - PE_y}$$

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.
1,2,3	Low	Yes	This data is required for the calculation of project emissions.
4,5,6	Low	Yes	This data is used for the calculation of project electricity generation. This data is monitored using meters and standard testing equipment, which is regularly, calibrated following standard industry practices.
~~12,13,14~~	~~Low~~	~~No~~	~~The data is directly calculated for the baseline emissions calculation. QA procedure is not needed.~~
~~15,16,17~~	~~Low~~	~~No~~	~~This data will be obtained from the official sources. Therefore QA procedures is not needed.~~

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 project is operated and managed by ISL who is the project proponent. ISL has ensured safety in operation of the plant as per quality management plan prepared for the site. The sponge iron site also has an ISO 9000:2000 based Quality Management System (EMS) in place and the power plant will also be included in the ISO 9000:2000 based Quality Management System. Accordingly, the monitoring plan used herein will be an integral part of the Quality Management Programmes and would be constituent of operational and management structure of this Quality Management System.

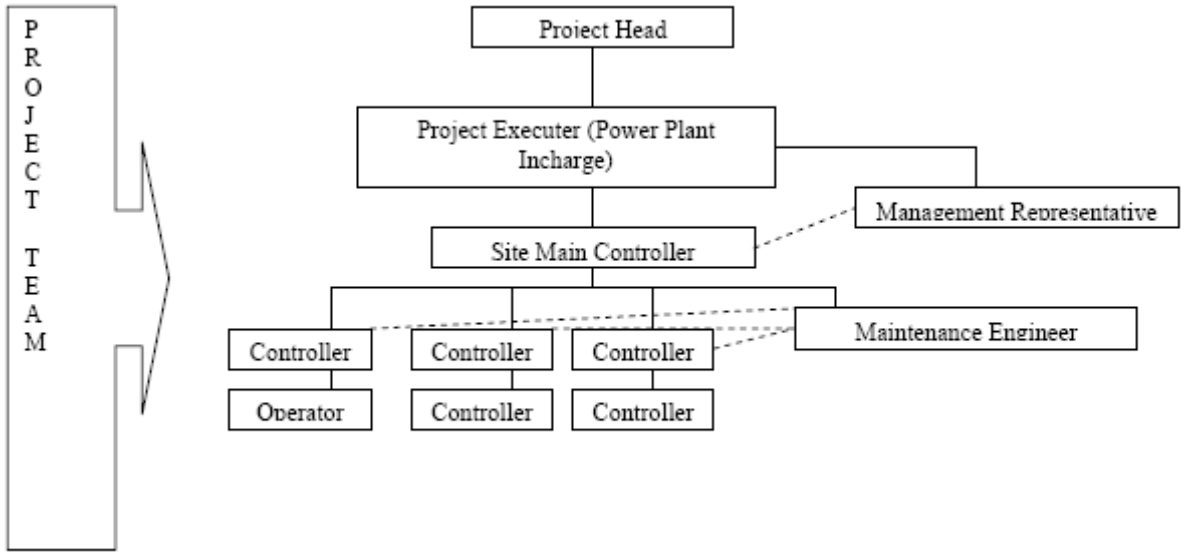
Managing Director (MD) has constituted the CDM project team, which is responsible for the project activity. The team is responsible for monitoring,

verification and recording of the data. ISL has well diversified procedure for collection of data and analysis of data at different levels and for subsequent corrective actions as when required in line with these policies. The site main controller is responsible for checking the information consistency. The power plant operator is responsible for managing the computer system, which are utilised to store the data. The power plant operator collects the data and stored the data in the computer system. The controller checks the accuracy of the data and verifies the storage of data. The controller and maintenance engineer report to the site main controller who reports to Project Executor and Controller. Project Executor report to the Project Head.

Inspection and record daily check list of critical parameters of project activity is maintained. The maintenance staff access the condition of all the power plant equipment and measuring equipment and any action required is taken.

On a daily basis the monitoring reports is checked by the operation head. In case of any irregularity in the project activity it is reported to the operation head.

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Monitor & Verify the CDM Project and data

List of Key person:

Project Head : Managing Director
Project Executor & Controller : General Manager (E &I)
Site main Controller : Asst General Manager (E & I)
Controller : Shift In charge
Management Representative : AGM (QC)

Designation	Responsibilities
Project Head:	Registration
Project Executer and Controller:	Project Execution and Operation

Management Representative	Control of documents
Site Main Controller	Monitoring & Verification of data (once in a day), Operation
Controller	Monitoring of data collection, Checking of data, Operation Power generation , Data collection , Checking data accuracy ,Data recording cross checking
Maintenance Engineer	Mechanical Maintenance, Energy input meter monitoring & Maintenance, Energy outpur meters. WHRB maintenance , TG 1, ESP, Pump House
Operator	Data collection , data recording, data storage

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

PricewaterhouseCoopers (P) Limited, has assisted the project proponent in determining the monitoring methodology.

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