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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

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Title of project activity	:	Waste Heat based 10 MW captive power project “GPIL- WHRB 2” CDM PROJECT ACTIVITY
CDM document version No	:	2
Date of the CDM document	:	10 Dec.2005.
Date of First Revision	:	27 March 2006

A.2. Description of the project activity:

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Purpose of project activity

The purpose of the proposed project activity is to generate steam for generating electricity using waste heat contained in the waste flue gases released from ABC of Direct Reduced Iron (DRI),i.e. Sponge Iron Kiln i.e. from Sponge Iron making Process. The heat contained in waste gases will be transferred to Water which converts water in to steam in Waste Heat Recovery Boiler (WHRB-2). The steam produced will be fed into the turbo-generator through a common header to generate power, i.e. electrical energy. The estimated power generation capacity will be 10 MW.

The purpose of the project activity is to achieve better energy efficiency, achieve sustainable development in the industry and improve the working environment of Sponge Iron-making process. The 10 MW electricity produced by the new project activity shall be pooled with the already established and operating captive power plants having 7 MW WHRB and 11 MW FBB, Power. The power so generated shall mainly be used to meet the captive power requirement of GPIL Plant itself and surplus power (when due to any reason the captive demand for power will be less than the generated power) will be wheeled through Chhattisgarh State Electricity Board (CSEB) transmission and distribution (T & D) lines to meet the power requirements of its group Companies:– Hira Steel Ltd. located at Rawanbhata and R.R. Ispat Ltd. located at URLA, both in Raipur Tehsil of Chhattisgarh State; and in case when these units also would have less demand then surplus power will be fed to the Grid as infringe power. During the implementation of the existing project (i.e. 11 + 7 MW= 18 MW Power Plant) the company had already sought permission to Wheel upto 13 MW of Power to their Group Companies,

The net result is reduction in the demand of electricity from state grid supply and resultant reduction in GHG emission; as the grid is grossly based on the coal based power generation.

Background of the company

The main activity of GPIL is to produce Sponge Iron, Ferro Alloys/Pig Iron steel billets, and Wire Drawing etc . The company already had established one Sponge Iron production Rotary Kiln with 350 tonnes / day (105000 tonnes/annum) capacity using Coal as fuel. Based on the CDM Strength the company also had established one 7 MW WHRB power plant in the year 2002. The company had also established one 11 MW FBB power plant based on Waste Fuel such as Char Dolochar and Coal. Subsequent to this the company had decided to put up WHRB Power Plant in all the three proposed 500 TPD Sponge Iron Plants, 35 MW Waste Heat Recovery Boilers (based on CDM strength), out of which one Sponge Iron Rotary kiln with 500 TPD production capacity is set up along with the existing 350 TPD Sponge Iron Kiln and the other two are being setup at the adjoining land area. The flue gases emitting out of ABC from the newly set up 500 TPD Sponge Iron kiln at high temperature of 950^0C contain a significant amount of heat Energy. GPIL is installing a new waste heat recovery boiler (WHRB-2) after the ABC of new 500 TPD Kiln to recover 75% of this heat energy to produce medium pressure steam. The steam will be further utilised to generate electrical energy; by installing a new but second hand 10 MW capacity steam Turbo Generator. Subsequently the company shall install a 30 MW capacity Steam Turbo Generator to improve energy efficiency. To operate this TG the available steam from the existing Boilers and the new Boiler will be pooled.

The added 10MW WHRB capacity is treated as a new facility as per approved methodology and is referred to in this PDD as WHRB-2.

In the absence of this new project activity, the flue gases emitted through stack would have been lost to the atmosphere. The fresh project activity comprises of, Flue Gas Transfer piping and Duct; Waste Heat Recovery Boiler (WHRB) and piping with common header to transfer the steam to the Turbo Generator. The fresh unit will have 10 MW gross Electricity generating capacity, equivalent to 56.28 million KWh power units / year based on 70% PLF.

Power produced from the now added STG sets will be pooled and synchronised with the existing waste heat recovery and waste fuel based power generation sources for consumption firstly to meet the Auxiliary power requirement of the Waste Heat Recovery Boiler and Captive Power Plant; then for in house captive power consumption, in the associated industrial manufacturing activities, such as operation of : Sponge Iron Plant, Induction Furnace for production of Steel, Sub-merged Arc Furnace for production of Ferro Alloys or Pig Iron, Wire drawing Unit, Oxygen Plant, Ash Brick Plant, etc of the company situated within the same premises. A separate wheeling arrangement with CSEB is not required for the proposed 10 MW power as this amount of power generation will be primarily consumed for captive use. However considering the previously installed capacity of 18 MW CPP, remaining surplus power will be wheeled through Chhattisgarh State Electricity Board (CSEB) grid to the group Companies; as CSEB is the only available grid network and statutory agency to wheel power within Chhattisgarh state.

A power wheeling Agreement was signed with CSEB for the previous FBB and WHRB based Power Generation capacity, according to which GPIL can wheel maximum of 13 MW surplus power to the group Companies through transmission lines of CSEB. All Costs of providing equipment for synchronising and evacuating the power to CSEB grid for such transmission were borne by GPIL alone. The group Companies are located within 10 KM radius and hence transmission losses /leakage for wheeled Power are negligible.

The main carbon benefit from the new facility of the project arises from the replacement / displacement of an equivalent amount of electricity which would have been otherwise drawn from CSEB grid in the absence of this fresh project activity. The CSEB grid electricity has high carbon intensity as 85% power drawn into the grid is from Coal based generation.

The total CO_2 emission reduction for the entire crediting period of 10 years have been calculated as 504690 Tonne CO_2 –equivalent. The other benefits being reduction of GHG emissions considering global scenario, Sustainable development through better energy efficiency and it also leads to improvement of Local environment.

Facility Available and New Facility being created:

The industry is basically a sponge iron making facility complete with other associated activities. Out of which it has one FBB(fluidised bed type boiler) with 11 MW equivalent steam generation capacity and a WHRB(waste heat recovery boiler) with 7 MW equivalent steam generation capacity, connected to a common steam header which has a provision to feed required qty of steam to Two no' of 10 mw capacity each Turbine Generators. It is now proposed to install another waste heat recovery Boiler called WHRB-2, and to connect this fresh 10 MW WHRB steam also to the same header and install another fresh 10 MW turbo generator to best utilise the available steam to generate power from one or all of the healthiest and best efficient turbine in accordance to the availability of steam. The proposed fresh 10 MW TG is also second hand set. After the successful commissioning of this fresh 10 MW TG in future the company proposes to add. With these TG sets one more new 30 MW capacity TG in future, to achieve better energy efficiency, by operating the healthiest and most efficient turbines.

GPIL has already applied for registration of the existing WHRB based 7 MW power generations as CDM PROJECT activity, and the same is under process.

The concept of common header for steam is adopted to achieve maximum energy efficiency, higher equipment utilization in power generation and achieving proper synchronisation with grid.

GPIL will have proper monitoring system to calculate the actual power generated out of the actual steam generation by WHRB2 based CPP and accurately record the reduction in CO_2 emissions. GPIL has aimed at achieving complete transparency in monitoring, recording and calculating reduction in CO_2 emissions.

The Project activity achieves the following goals.

- Utilisation of heat energy of waste gas.
- Meet the power requirement without any T & D losses.
- Helps to become self reliant and less dependant on grid supply of electricity.
- Upgraded technology to achieve sustainable Industrial growth in State.
- Conserve natural resources and environment.
- Reduce the disparity between demand and supply of grid electricity.
- Save valuable water resource by using advance Air cooling technology.
- Promotes the sustainable development.

The project activity will lead to sustainable development and promote sustainable Industrial growth by conserving natural resources and preventing the thermal pollution even though no such statutory requirement exists. The future power generation in the state continues to be fossil fuel based.

Social benefit to state

CSEB has projected Power deficiency in the state between generating capacity and demand and supply of electricity from grid; leading to import of electricity from central grid and other sources. Hence the project activity contributes in reducing this deficit by not making demand from CSEB grid for electricity, which would have been the case if the fresh project activity is not achieved. This allows CSEB to supply electricity to other Consumers. This enables the CSEB to satisfy more consumers leading to more employment for skilled and professional people in the state.

The project activity also increases the employment within the Company GPIL for skilled manpower and Professionals.

Economical Benefits to State.

The state will generate revenue out of the manufacturing activities, supported because of this captive power generation by way of Sales Tax; Excise Duty; Entry Tax etc.

Environmental Benefit

The Power generation in Chhattisgarh state is mainly fossil fuel Coal based. Power plants which are usually run by State Electricity Board contribute 1400 MW of which 85% is Coal based. The waste heat recovery CPP in GPIL will displace /replace the grid power; thus Project activity saves further depletion of natural Coal reserves.

The Project activity uses Waste heat recovery based Power Plant by utilizing waste heat from flue gases coming from process and thus effectively saving environment of thermal pollution.

The proposed waste heat based power generation activity does not consume coal thus there is no generation of any solid waste like fly ash which would otherwise be generated on consumption of coal. The disposal of fly ash has been a serious environment concern. Thus the Environment is also benefited by reduced solid waste problem.

The adoption of new advanced air cooling technology for cooling and condensing of turbine exhaust steam will help to save water resource.

Reduction of T & D Losses of Power

CSEB State grid has almost 37% T&D losses. The Power generated by new Project activity will be used for in house requirement and consumption without any T&D losses as the location of power generation is in the same premises.

Thus effectively 10 MW Power generation will have ‘Grid Generation Replacement effect’ of 13.7 MW Power which would otherwise be generated and transmitted through grid from Thermal Power generating units.

Reduction in Waste Water.

The Water consumption and Waste Water generation will be minimised by using the advanced Air Cooled condensers. The generated waste water will be used for in house activities like fire fighting, sprinkling for dust emission control, and green belt development etc.

Reduction in SPM level in the Atmosphere and other additional Economic benefits.

The proposed ESP shall remove the ash from Flue Gases which will be collected in Ash Hopper. This Ash will be given free of cost to cement plants & brick manufactures for further Economic benefit and use. The ash used for production of bricks saves the valuable productive soil, also it reduces the Air Pollution caused by the conventional Brick Kilns, due to the Coal burning.

A.3. Project participants:

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Name of the Party Involved (host) host party-	Private and/or Public entity (ies) Project Participant as applicable	Kindly indicate if the party involved wishes to be Considered as project participant (Yes/ No)
India (host) **Ministry of Environment and Forest**	Public entity	No
	Godawari Power & Ispat Ltd.-- Private entity	Yes

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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India

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

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Chhattisgarh

A.4.1.3. City/Town/Community etc:

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Siltara / Raipur District

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

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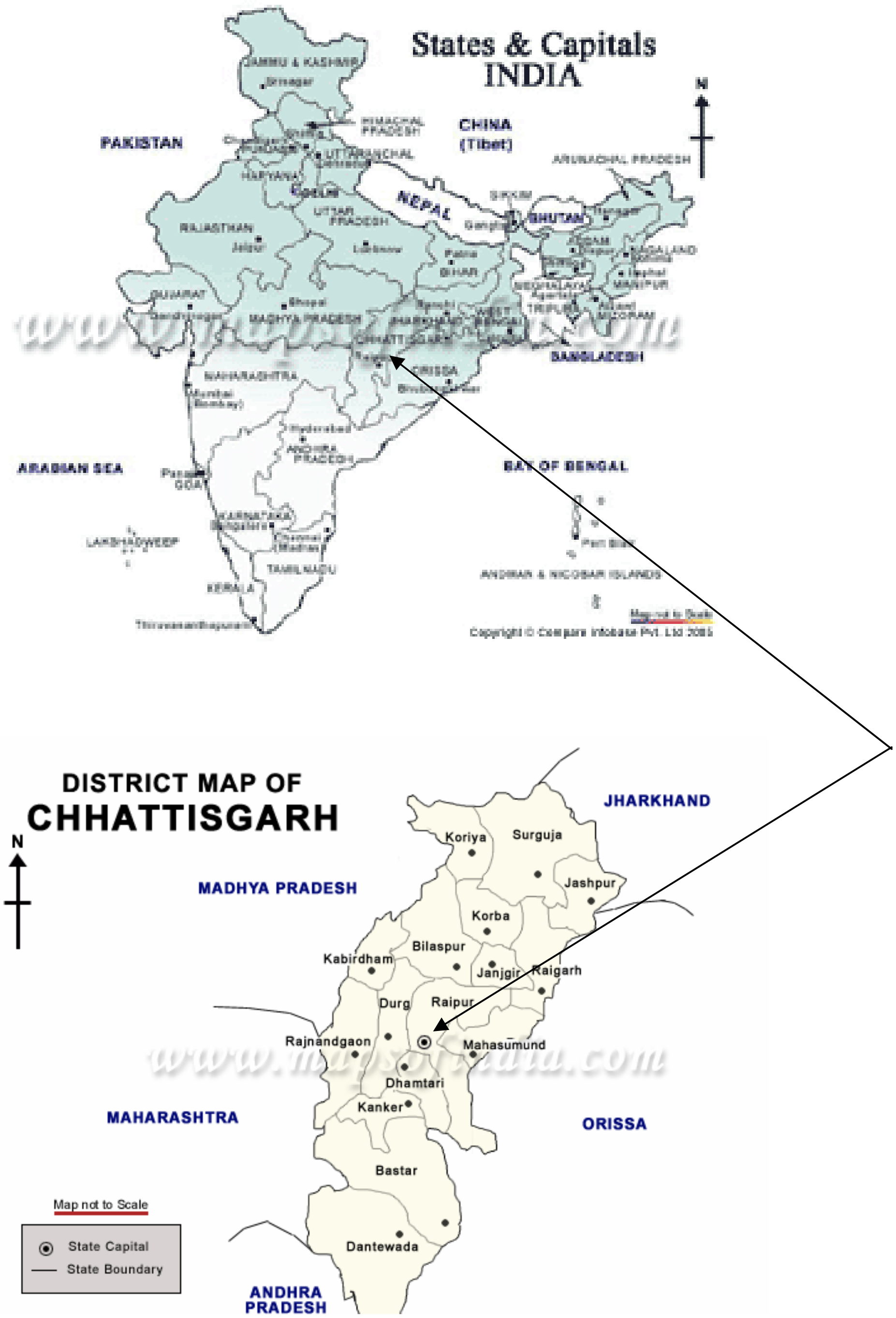
Physical Location:

Within the existing premises of Godawari Power & Ispat Limited (Previously known as Ispat Godawari Ltd.), Phase –I, Siltara Industrial Area, Bilaspur Road, Siltara, Raipur District, Chhattisgarh State, India Longitude 81^0 41' E Latitude 21^0 23' N nearest Railway Station : 17 KM, Raipur.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Raigarh
Durg
Raipur
Rajnandgaon
Mahasumund
Dhamtari
Kanker
Bastar
Dantewada
Map not to Scale
State Capital
State Boundary

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

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The project activity is an electric power generation project utilising waste heat where aggregate electricity generation savings exceeds the equivalent 56280 MWh per year. The project activity may be principally categorised in category –1 Energy Industries (Renewable /non renewable) as per Scope of Projects activities enlisted in the "list of sectoral scopes and approved base line and monitoring "methodologies" (version-3) ***on the website for accreditation of "Designated operational Entities".***

The CDM PDD is based on approved methodology ACM0004 version 02 and sectoral scope; 01 03 March 2006 "Consolidated Baseline methodology for waste gas and/or heat and/or pressure for power generation" of 03 March 2006

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

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In the new facility being created, the Waste Heat Recovery (WHR) based captive Power Plant at GPIL shall utilise the heat Content of 125000 NM^3/ HR of Flue gases at 950 ^{0} C coming out of ABC of Sponge Iron kiln.

The Exhausted flue gases from Rotary kiln are received at After Burning chamber (ABC) for further incineration where the waste gas temperature reaches 950^0C after ABC. No auxiliary fuel is fired in ABC.

This waste heat shall produce 54 T/hr to 55 T/hr of steam at 35 kg/ cm^2 pressure at 410 ± 5^0C Temperature. The boiler will be of 3 flue gas passes. The waste heat boiler shall consists of radiation section in the first pass, screen section, Super heater section divided into Primary Super heater and Secondary Super heater, an attemperator, a Convection section (evaporator) in the second pass and another Convection section (evaporator) and an Economiser section is the third pass.

All three passes are provided with the hoppers for ash Collection.

The outlet box of the WHRB, leads to ESP to remove SPM from exhaust gases. The exhaust gas temperature is kept below 200^0C. The Heat recovery from flue gases is around 75-78%.

The moderate pressure WHRB along with high efficiency extraction cum condensing multi stage Steam Turbine and Generator (STG) shall be operated to generate 10 MW Electricity by installing another 10 MW TG set. In future one 30 MW TG set will be installed to achieve better energy efficiency. GPIL already operates 2 STG's each of 10 MW capacity feeding steam simultaneously to both or one at a time from existing WHRB and FBB, according to availability of steam. Similarly in future the required number of STGs will be operated according to the availability of steam to achieve the best energy efficiency.

Ash collected from WHRB hoppers & ESP will be conveyed pneumatically to Ash Silo. The ash will be given free to cement plants and brick manufactures.

Other systems required are circulating water, Demineralised water plant, Instrument Air Compressor and Exhaust Steam Condenser.

Steam from WHRB passes through steam turbine rotor and then is condensed by circulating water. Circulating water takes the heat from condensing steam and this heat is removed in Air cooled Heat Exchanger.

Only Demineralised water is used in WHRB to avoid Scale formation on boiler tubes. Make up water is de-aerated.

Total Waste water is recycled and reused after treatment.

The 10 MW power generated shall be used to meet fully the captive power requirement of the Company.

The technology is environmentally safe and abides all legal norms and standards for SPM, emissions.

The project activity will be working 335 days in a year. No supplementary fuel is used in WHRB. Hence during the shut down of Rotary kiln CPP will also not function.

In summing up, the following parameters are:

1) Heat recovered from waste flue gases : 320 million KWH t / annum
2) Total Electrical Energy generated : 56.28 million KWH e/ annum

The project activity was started with equipment selection and ordering process in APRIL 2004. The Captive Power Plant shall be Commissioned in DEC 2005 and the zero date for CER calculation & quantification of CO_2 reduced by this Project activity would be from the date of registration as CDM project activity.

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:

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The project activity will generate 10 MW power using the non-GHG emitting technology – waste heat recovery and steam generating system. In the absence of Project activity, the power requirement would be drawn from CSEB grid. The grid power is 85% thermal; that is Coal based . As the project activity generates power based on waste heat with non GHG emitting technology and the power generated shall be actually and effectively reducing the demand on CSEB grid. The CO_2 emission reduction will be achieved to reduction of corresponding CO_2 emission in CSEB grid power .

This project activity will be carried out by GPIL while there exists no legal binding for utilising the heat content of waste gases. The project activity is over and above national or state requirements.

The project activity is carried out by GPIL by overcoming the barriers explained in section **B-3 STEP-3.**

However, in spite of all the barriers, GPIL conducted the project activity of WHRB based CPP with non- GHG emitting technology, with the sole intention to meet the internal demands of Power with no impact on emissions from the existing plant.

In the absence of project activity, the power requirement will have to be met from CSEB grid contributed by thermal power plants based on fossil fuels.

Therefore the reduction on demand from Grid will effectively reduce CO_2 emission.

The project activity will displace electricity from the grid and effectively reduce an estimated annual average of 50469 tonnes CO_2 emission.

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

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Chosen credit period = 10 years.

Years	Annual estimation of emission reductions in tonnes of CO_2eq	
2006-2007	50469	
2007-2008	50469	
2008-2009	50469	
2009-2010	50469	
2010-2011	50469	
2011-2012	50469	
2012-2013	50469	
2013-2014	50469	
2014-2015	50469	
2015-2016	50469	
Total estimated reduction	504690	Tonnes of CO_2 e
Total numbers of crediting years	10	
Annual average over the crediting period of estimated reduction	tonnes CO_2 e 50469	

A.4.5. Public funding of the project activity:

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No public funding from parties included in Annex-I is available for the project activity.

SECTION B. Application of a baseline methodology

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

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Consolidated baseline methodology for waste gas and/or heat and/or pressure for power generation.ACM0004/ Version 02, Sectoral scope : 01, 3rd March 2006.

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

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The approved methodology applies to electricity generation project activities;

- that displace electricity generation with fossil fuels in the electricity grid or displace captive electricity generation from fossil fuels;
- Where no fuel switch is done in the process where the waste heat or pressure or waste gas is produced after the implementation of the project activity.

The methodology covers both new and existing facilities. For existing facilities, the methodology applies to existing capacity, as well as to planned increases in capacities during crediting period. If capacity expansion is planned, the added capacity must be treated as a new facility.

The project activity meets the applicability as it meets the above conditions set out in approved methodology

1. The project activity includes heat recovery from waste flue gases generated from GPIL'S second sponge Iron kiln through new WHRB by producing steam. The steam will be utilised in turbine to be installed for 10 MW power generations.
2. The Power will be used in house.
3. In the absence of the Project activity, the Company would have drawn equivalent of 10 MW power from CSEB grid. Hence the power plant displaces imports from the grid which distributes mainly fossil fuels based power.
4. There will be no fuel switch in sponge iron manufacturing process after the implementation of the Project activity.
5 There is no possibility of any future change in fuel mix of power generation in grid as the coal is naturally and abundantly available fuel. In addition to this the Grid based power plants have been designed to operate on coal as Fuel. Any change in Fuel may require substantial change in the operating equipments plant and machinery hence the possibility of change in Fuel mix in the grid is not possible in near future.
6. The project activity is carried out as a part of planned increase in capacity of sponge iron production from 350 TPD to 850 TPD by adding the second Sponge Iron Kiln. Hence the project activity is treated as new facility for the added 500 TPD Sponge Iron production capacity related to Waste Heat Recovery Boiler and Power Plant.
7. The base line calculations for CO_2 emission reduction are in line with approved methodology and data drawn from CEA (Central electricity authority) Data and Western Regional Electricity Board.
8. The project activity also reduces the thermal pollution in the area by recovering heat.

9. By successful operation of project activity, the project activity is able to displace/ substitute equivalent 10 MW power Units with an emission reduction of 50469 tCO_2/annum (**Ref. Section- E**).
10. The project activity adds no additional GHG emission.

Hence it is concluded that the selected methodology meets the conditions set out in approved methodology

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

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We explain below the basic assumptions of the base line methodology.

1. Project activity displaces the electricity generation with fossil fuels in CSEB grid.
2. Project activity is based on waste heat utilisation to generate 10MW electricity. This will be used for in plant operation for captive purposes mainly. However during decreased captive demand the surplus will be fed to the grid.
3. There is no option to use any other fuel in the Project activity other than waste heat from flue gases coming from ABC of Rotary kilns.
4. There will be no fuel switch in rotary kiln from where the waste gases are produced and, further used in project
5. In the absence of Project activity, the electricity requirement of 10 MW could be met by setting up a 100% coal based captive power plant or a coal based captive power plant capable to use coal and char/ dolochar, (the abundantly available fuel) or the required power would be drawn from CSEB grid. There are no limitations to power supply from grid.
6. There is no legal binding that the waste heat is to be recovered. The Project activity is being implemented as an Economical activity to reduce the import of Power from grid and to further reduce the thermal emissions.
7. Project activity effectively uses the waste heat to generate Power of 10 MW which would have otherwise been imported and hence grid will be able to supply 10 MW power to other consumers.
8. Other use of waste heat in any other way would not effectively reduce the CO_2 emissions directly / indirectly. GPIL has no other alternative use for thermal energy.

As highlighted in baseline methodology we consider the following potential alternatives

1. Proposed project activity not undertaken as a CDM activity
2. Import of electricity from grid
3. New CPP based on other alternative fuels
4. A combination of 2 and 3
5. Alternative use of waste heat from flue gases
6. The continuation of the current situation

Detailed explanations of each alternative are given below:

1. Proposed project activity not undertaken as a CDM activity

In absence of the CDM benefit the proposed project activity possibly could not be implemented due to number of barriers such as Technology barrier, Financial barriers etc. as explained in B.3.

In absence of the proposed project activity the unit would have established its' own captive power plant based on coal or drawn power from CSEB grid and the total flue gases containing huge amount of heat would have been emitted to the atmosphere as usual. This would have amounted to net loss of waste heat contained in the flue gases in to the atmosphere.

2. **Import of electricity from grid**
This is Business As Usual (BAU) scenario as CSEB will continue to supply required power. This will meet all legal and statutory obligations of Country. As the power from CSEB grid is mainly fossil fuel based the reduction of CO2 emissions is not achieved in BAU situation.

3. **New CPP based on other alternative fuels**
A CPP based on diesel oil/coal can be installed. The Diesel or any Petroleum Fuel based Power Plants are not feasible because of Highly Fluctuating rates and Higher cost of generation, than the Grid. Also this option will add GHG gas emissions to the existing scenario. It also involves high capital cost and high cost of operation.

Natural gas is not available in this area and hence ruled out as possible fuel. COAL as a fuel which is available as Raw Coal and Char/Dolochar i.e. partially-burnt coal, these can be used for CPP. Using only Char/ Dolochar will result in larger size of boiler as compared. It will be necessary to mix char with fresh coal to reduce boiler size and to facilitate smooth operation to purely coal fed Boiler. Combustion of Pure Char/ Dolochar poses difficulty. Hence GPIL already have FBB based boiler using char with coal to produce 11MW power. Such installation will require regular Coal linkage from Coal Mines as well as long term supply of Industrial Waste Char Dolochar from Industries. This option of Coal based power plant based purely on 100% Coal or even mixed with Char- Dolochar is a better economically feasible option for the unit, as it generates power at the lowest cost. But this will emit GHG. This will also require longer time to implement hence not considered as plausible option for the baseline consideration.

While considering all the other possibilities it is well established that all the above alternatives meet the local and national norms and are not mandatory. It is out of the will of an entrepreneur to select the suitable option.

There is no legal compulsion for Sponge Iron Plant to set up the Power generation or to setup a Waste Heat Recovery System. In addition to this there is also no restriction to obtain power from the CSEB Grid or to generate own power through a Captive Power Plant based on Coal or based on coal mixed with Char/ Dolochar.

4. **A combination of 2&3**
Any Combination of 2&3 has same disadvantages **as in 3**

5. **Alternative use of waste heat from flue gases**
The waste heat is not useful in any form of use in the existing plant as GPIL does not have heating requirements in the process of manufacture of sponge iron where thermic oil or hot water or Hot Steam can be used. Historically the hot gases are let out into atmosphere leading to thermal emission. So far other use for Waste Gases and Waste Heat has not been developed in the state of Chhattisgarh.

6. **The continuation of current situation**
It is a BAU situation and covered in alternative 2.

As continuation of current situation is not possible in view of alternatives 1 and 3 being not plausible options. Hence continuation of current situation is not baseline**.**

The analysis of the above 6 alternatives shows that the best options available to GPIL are to go for BAU scenario as in alternative-2

In base line grid power will continue to add GHG emissions.

The project activity displaces the grid power and hence achieves reduction of CO_2 Emissions.

In **Section B.3**; we have demonstrated the project activity is additional by using the tool for the demonstration of additionality.

Key methodological Steps followed in determining the baseline scenario

1. **The methodology requires GPIL to establish base line scenario by considering all possible options that provide or produce electricity for in house consumption and /or sale to grid and/or other consumers. The methodology also identifies six possible alternative scenarios.**

We have discussed above each alternative and shown that the import of power from grid as base line scenario**.**

2. **The methodology requires us to demonstrate the additionality of project activity using the " latest version of Tool for demonstration and assessment of additionality".**

We have shown the additionality of project activity using the " Tool for demonstration and assessment of additionality version 02 of 28 November 2005'' In **Section B.3**

3. **The methodology applies to electricity generation project activities; that displaces electricity generation with fossil fuels in the electricity grid or displace captive electricity generation from fossil fuels, where no fuel switch is done in the process where the waste heat or pressure or the waste gas is produced after the implementation of project activity.**

We have established that project activity generates electricity which displaces grid power which is fossil fuel based and there is no fuel switch being done in the rotary kiln where the waste gases are produced in this project activity.

Key Information and data used to determine the baseline scenario

Key information data like generation of electricity, fuel consumption, auxiliary fuel consumption, calorific value, oxidation factor emission factors are taken from the following sources to determine the baseline scenario:

1) Annual Report of Western Regional Electricity Board for 2004-05
2) General Review 2002-03 and General Review 2005 of CEA.
3) Review of Thermal Power Stations 2002-03, and 2003-04 & 2004-05

4) IPCC Guidelines.

These data are given in **Annex-3 under Base line information (Baseline calculations)**

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:

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Explanation of how and why the project activity is additional in accordance with the baseline methodology

It is required to describe how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of registered CDM activity the proposed CDM project activity is designed to generate power from the Waste Heat only contained in the Flue Gases emitting out of an established industrial manufacturing process i.e. ABC of Sponge Iron Kiln, only the waste heat in the flue gases will be utilised to generate power without adding any GHG emission whereas in the absence of the proposed project activity power requirement would have been met by drawing the power from CSEB Grid power which has mainly GHG gas emitting Fossil Fuel (Coal) based Thermal Power generation sources.

It is required to explain how and why the proposed project activity is additional and therefore not the baseline scenario in accordance to the selected baseline methodology.

As per the decision 17 / CP.7 AND 18/CP.9 a CDM activity is additional, if anthropogenic emissions of GHGs by sources are reduced below those that would have occurred in the absence of registered project activity. The tool for the demonstrations and assessment of additionality (version 2) of 28 November 2005 approved at the 16th meeting of CDM executive board requires the project participant to demonstrate and assess additionality, as per the steps given below:

1) Identification of alternative to project activity.
2) Investment analysis to determine that the project activity is not the most or financially attractive.
3) Barrier analysis.
4) Common practice analysis.
5) Impact of registration of proposed activity as CDM project activity.

We have discussed realistic and credible alternatives available to project activity in B.2 and have come to conclusion that the import of power from grid is the baseline scenario. We hereby proceed to establish the additionality of proposed project activity using “the tool for the demonstration and assessment of additionality” (version 02) dated 28 November 2005.

We show that the project activity faces significant financial and investment barriers and in the absence of CDM finance these barriers would impact the project activity.

The base line methodology outlines five steps to demonstrate additionality.

STEP 0 - Preliminary screening based on starting date of the project activity

The project activity is scheduled to be completed by DECEMBER 2005 and hence there is no possibility that the project will be registered as CDM project activity before 31-12-2005.

However we give below the evidence as proof that incentive from CDM was seriously considered by GPIL, who is project participant.

1) GPIL, had already planned to put up the WHRB CPP based on CDM Project activity accordingly they have commissioned their first CPP of 7 MW capacity using WHRB based technology using hot flue gases from their first Sponge Iron Rotary Kiln in the period which lies between 1st January 2000 and 18th November 2004 i.e. date of registration of first CDM project activity. CDM-PDD for 7 MW project has been submitted for validation.

   This shows that GPIL is fully aware of the financial impact of a CDM project activity and hence the Board of Directors decided to go for this New Project also as CDM Project activity accordingly, in spite of the financial and technological barriers which are explained later in this chapter they have proceeded to put up the second project activity of 10 MW WHRB based CPP capacity which is similar to the earlier project activity.

2) As a responsible Company, GPIL is environmentally conscious of both local and global environmental requirement. In spite of the various barriers, GPIL went ahead with the project activity in view of CDM benefits.

The project activity will be commissioned after 18th Nov. 2004. (Registration date of first CDM project) and GPIL is fully aware that the CDM benefits will be calculated from the date of registration.

Even then as a responsible company, GPIL has gone ahead with the project activity which can be proven by official records like negotiations with the CDM consultants, Meeting of the Board of Directors, order placements for equipment etc.

STEP-1 Identification of alternatives to the project activity consistent with current laws and regulations.

Sub-Step-1a. Alternatives to the project activity.

We have discussed realistic and credible alternatives to project activity in B.2 to establish the applicability of baseline methodology. We herewith discuss the same points as below:

1. There is no law or stipulation either from state or central governments that waste heat from flue gases should be essentially recovered.
2. Hence in the absence of Project activity. The flue gases are thrown in to atmosphere thus generating thermal emissions.
3. The required power is drawn from the CSEB grid which has set no limits to provide the required power. This is business as usual scenario.
4. Such an additional demand in the absence of Project activity would be enabling CSEB grid to import more electricity from central grid or other alternatives, which are mostly Coal based power sources.

5. Effectively, the extra supply /generation demand would have generated the CO_2 emissions. Such CO_2 emission have been avoided by the project activity which uses only waste heat and adds no additional CO_2 emission. At the same time project activity generates 10 MW power in CPP for captive Consumptions.
6. The other alternative would be to install the HSD/ COAL based CPP to produce 10 MW power. However these alternatives are not plausible as already explained in B.2 and they will result in an additional GHG emission.
7. GPIL has no other use of Waste Heat in the process. Also there is no alternative use of Waste Heat at present in this Region.
8. The financial and other barriers would have prevented GPIL in putting up WHRB based CPP and would continue to draw power from CSEB grid as BAU scenario; if CDM project activity benefits are not available.
9. Hence the project activity is clearly a CDM project activity.

Sub-Step-1.b. Enforcement of applicable laws & regulations

1. The present laws prevailing in India or in Chhattisgarh state do not make it Compulsory to use Waste Heat from the plants to avoid thermal pollution in the local Air.
2. All the alternatives listed in **B.2** and sub step 1.a meet the existing laws and regulations.
3. The GPIL Sponge Iron plant (Kiln Two) operating presently without WHRB based CPP is in line with all the present existing laws and regulations.
4. The project activity is only additional activity being carried out by project participant in spite of the various barriers and also project participant is not bound by any law or regulation to set up CPP or any measure to recover waste heat from flue gases from ABC of its' Rotary kiln.

STEP-2 OR 3 GPIL selects step 3(barrier analysis) to show additionality

STEP –3 Barrier analysis to show additionality

Sub-Step 3.a Identification of barriers that would prevent the implementation of the type of the project *activity.*

Sub-Step 3.a.a Investment barrier.

1) As there is no legal / statutory requirement, the project activity does not fall in essential financial assistance parameters of financial institutions like Banks etc.
2) As there are no direct revenues from the project activity, the investments in project activity are to be generated from internal sources (as there is no immediate recourse available for raising the funds required from issuing further shares to the public for this project.
3) The gain being only notional, as no sale is actually done, the investment is the barrier for up gradation of technology and installing CPP based on WHR.
4) The generation of Power from Waste Heat contained in Flue Gases are Solely depended on the operation of the Sponge Iron Kiln. Looking in to the Iron Ore crisis, Coal crisis as well as Slump in Steel Market the operations of the Sponge Iron Kiln may face some interruptions and uncertainties, according to the market situation. Which hinder the lenders to extend the required finance to the Waste Heat based Power Project.

5) Similarly the utilization of the Generated Power within the Plant fetches the proper returns; failing with which the export of Power to the Grid as Infringe Power does not provide any attractive rates to operate the plant. However the consumption of Power again within the Plant to produce Steel or Ferro Alloys is highly influenced by the volatile and sensitive steel market as well as availability of all other Raw Material. Therefore the investors or the lender find it of greater risk to lend to CPP based on WHRB only than to invest in the conventional Coal based Power Plant.

Sub –Step 3.a.b.Technological barrier

1. Power Generation through the Fossil Fuel based independent power plants either using Coal or Coke or Liquid Fossil Fuel such as Furnace Oil or Diesel or LSHS or such other liquid fuel , through open combustion, to generate steam, to drive Steam Turbine coupled with Generator or fired into an Internal Combustion Engines to drive Alternators (Generator) have a total control on the fuel feed rate, as well as on the combustion air blow rate hence the flexibility of operation is enormous with these plants to achieve the best heat rate as well as the best possible plant load factors. Where as in the generation of power by recovering the waste heat from flue gases the operator of the facility has almost no control over the Quality and Quantity of the flue gases, thus the designing of a proper waste heat recovery system to generate power with the available steam, which is generated out of the available waste heat, is a great technology barrier. In addition to this operation of the system with the uncontrolled thermal energy availability is another technology barrier. As the power distribution and transmission system has to be designed to take care of all the possible variations and Fluctuations in power generation. Also the suitable backup arrangements are required to be designed and created to take care of all such fluctuations in power generation. Hence it is evident that the designing, installation and operation of a waste heat recovery based power plant with a sponge iron rotary kiln, based only on the flue gases without any auxiliary fuel support, where the flue gas generation quality and quantity is not under control of the power plant operator and wherein the Waste Heat of the flue gas qty & quality varies in accordance to a number of factors which influence the production of sponge iron in quantity as well as in quantity, is a great technology barrier.

   The company has partially overcome the above technology barrier in it's first 7 MW WHRB captive power plant. But the fresh 10 MW WHRB power plant also requires overcoming all the above technology barriers with the help of previous power plants experience.

   Utilisation of the fluctuating and unsteady power in the captive facility also creates lot of technological and operational hurdles, which result in inefficient energy utilisation, higher energy consumption as well as reduced production.

2. The area specific shortage of skilled professionals and workers to run the CPP is also another barrier. The PLF (plant load factor) also is dependant on the proper operations of equipment which in turn depends on skilled personnel, for their proposed project activity this is also one significant barrier.

Sub-Step –3.a.c Operational Barriers.

The operation of the Waste Heat based Power Plant solely depends on the operating status of the source of Waste Heat, i.e. Sponge Iron Kiln. The routine fluctuations in the quality of Iron Ore and Coal offer lot of variation in the quantity and quality of flue gases. In addition to this the frequent accumulation of the accretion in the Rotary Kiln forces the Kiln for shutdown for cleaning and maintenance almost at every 100 to 120 days intervals. All these create enormous operational barriers.

The utilisation of generated power is subject to the availability of the constant demand for power within the plant, whereas the operation of the other Power demanding facilities also are subject to a number of Technical and Commercial Forces; Such as the Health of those plants and equipments, availability of Raw Material as well as the Demand of the Goods in Market, as well as proper trained Manpower. Consequently any reduction in the captive demand may require to evacuate the generated Power to the Grid.

If unused part of power generated is required to be wheeled through CSEB grid either for the use of group companies or giving to Grid itself, then in such cases, any grid failure may result in damages to project activity. CSEB owns no responsibility towards such a damage as per the wheeling agreement between CSEB and project participant. This involves an additional capital / repair /replacement / maintenance expenses on the project participant GPIL.

It shows that there are substantial operational Barriers to operate the Project activity smoothly.

Sub- Step 3.a.d.Barrier due to prevailing practice.

Historically sponge iron manufacturers let out flue gases at high temperature by letting them out into atmosphere through high rising stack/chimney as there is no existing law prohibiting them and also sponge iron manufacturing process does not have any other use of heat. Also the entrepreneurs have preferred to draw the required Power from the Grid, as it offers them enormous operating comforts and freedom in the activities.

There by using waste heat of flue gases to produce steam and run the turbines to produce power, the project activity has to overcome the above barriers to produce eco friendly power and to displace the power generated by grid using conventional fossil fuels, which have higher GHG emissions, to generate electricity; while project activity produces no GHG emissions.

The proposed project activity is not Common practice as only 12 sponge Iron Plants out of 74 plant in the State, have WHRB based CPPs installed. Smaller Companies do not install the WHRB project as:

a) Capital Costs are high.
b) Returns are only notional
c) Present prevailing rules permits letting high temperature flue gases into atmosphere.
d) Incapability to raise the capital
e) Running Risk are high
f) Increase in the number of employees due to skilled labour requirement.
g) Labours laws being strict in India any increase in number of manpower is viewed as barrier.
h) Freedom of operation in restricted.

Sub-Step 3.a.e. Regulatory Barrier.

1) In case Reduced Captive Demand for Power the unused part of 10 MW power will be wheeled to group companies through CSEB grid who being government owned agency, are the only permitted agency to distribute power in the state of Chhattisgarh.

2) Any agreement with state owned CSEB grid has inbuilt procedural and bureaucratic related barriers involving time and documentation.
Additionally, CSEB and likewise other state boards do not necessarily welcome the CPPS in HT Consumers as they reduce their income at higher tariff rates which SEB's charge to HT consumers, in comparison to subsidized sectors of agriculture, domestic etc.

3) The wheeling agreement is totally in favour of CSEB as grid owner takes no liability for any mishap/losses . Any future/present actions involving all risks /losses to be borne by project participant for any failure of the grid and related back lash on the CPP machinery.

4) While CSEB will be making additional income by only wheeling the power through grid, all investment regarding connectivity has been borne by project participant.

Sub-Step –3.b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity).

As above the identified barriers are:

1) 3.a.a. investment barrier
2) 3.a.b technological barrier
3) 3.a.c prevailing practice barrier
4) 3.a.d operational barrier
5) 3.a.e regulatory barrier.

The identified other alternatives are:

1) Drawing power from existing CSEB grid (Alternative-2)
None of the above barriers act as barriers in this alternative, as it is business as usual scenario and CSEB would be having no objections to continue to supply the additional demand of power as already and presently the required power is being provided by CSEB.

2) CPP based on HSD/Gas/Coal (Alternative 3 and Alternative 4)
None of the above excepting 3.a.a to a minor extent act as a barrier in this alternative. However CPP based on HSD/Gas/Coal will have additional GHG emissions from the plant.

3) Alternative use of Waste Heat from Flue Gases (Alternative 5) other listed alternatives like using Waste heat from flue gases for other use in the plant is not applicable as GPIL has no such heat requirement in the plant. No other beneficial use of the Waste Heat is in practice in the region.

4) Continuation of the current situation, as shown above the continuation of current situation basically is Business As Usual (BAU). Hence there is no barrier to implement this alternative too.

STEP-4 Common practice analysis

We identify and discuss the existing Common practice through the following sub-steps which Complements additionality tests.

Sub-Step-4.a. Analyse other activities similar to project activity.

Total sponge Iron plants in the surrounding area of project activity = 74
i.e. in the State of Chhattisgarh.

No. of plants who have WHRB based CPPs	=	12
No. of project activities under consideration as CDM project activity	=	3

Even though the sponge iron manufacturing activities are showing expansion in the capacities ; the economical viabilities are linked to international and national demand for steel and the prices of Raw Material such as Iron Ore, Coal etc. At present the sponge iron manufacturers are facing losses due to slack in demand, as well as Raw Material resource crisis.

The above shows that hardly 16.25% people have gone for the WHRB, thus this can not be considered as common practice.

Sub-step 4.b. Discuss any similar options that are occurring:

1) Out of 12 plants who have WHRB based CPPs, 7 plants are Companies listed is stock market with an access to finance through equity and or other non Convertible / Convertible debenture issues. The company has not raised any funds from the Public for this 10 MW WHRB Project.
2) Three companies out of the rest five Companies who have similar barriers are in the process of CDM project activity registration. They have prepared CDM-PDD for registration now, as the approved methodology has come in force only recently enabling the Companies to work out CDM-PDD.

STEP – 5. Impact of CDM registration:

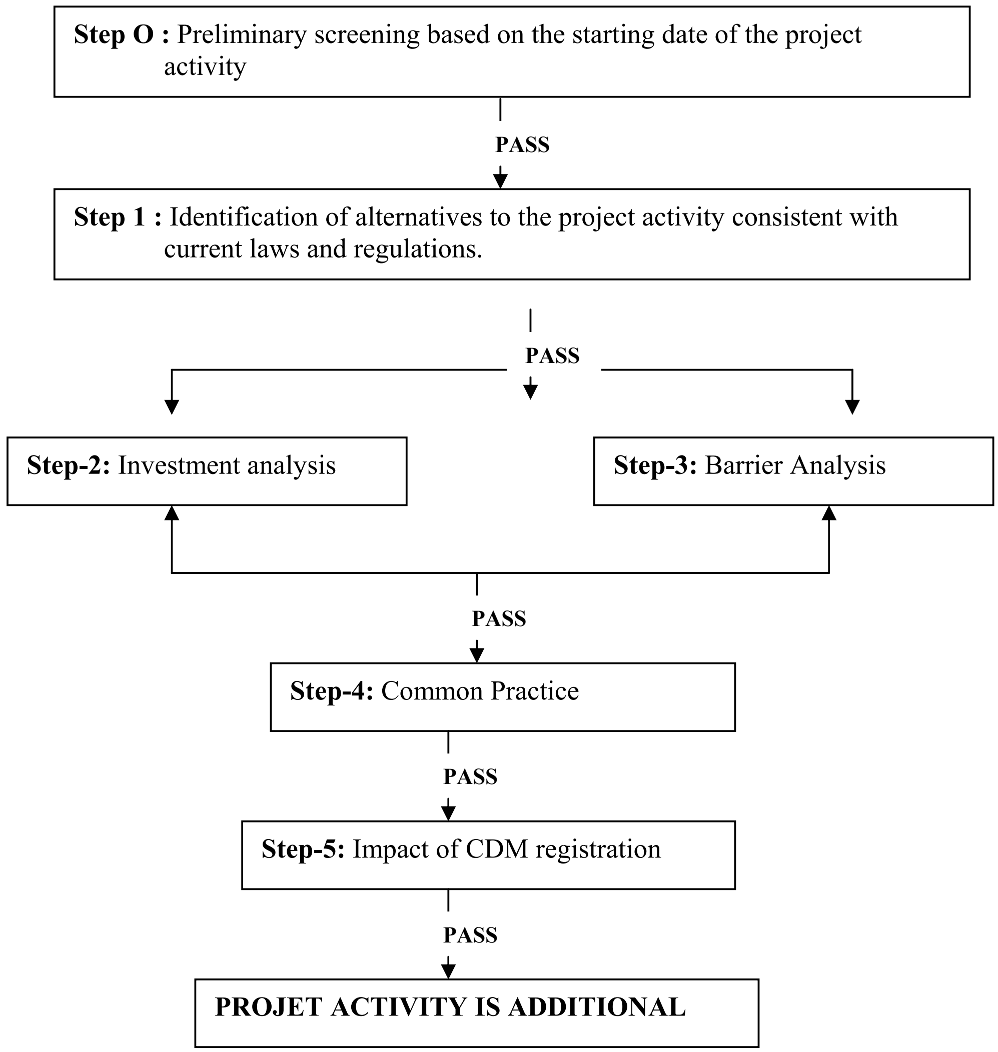
1) As explained in the above steps, through CDM registration project participant hopes to lower the risks of the investment associated with this kind of Project Activity where no actual sales and hence no direct income is achieved.
2) The possible income generated through sale of CERS will help in achieving sustainable Power generation.

3) The other benefits are

   * Reduction of GHG emissions
   * A successful CDM project activity will encourage unwilling companies due to prevailing practice to put up the WHRB based power plant or other renewable clean energy systems as CDM project activity.

4) An additional Social benefit will be clean environment in the area of Project activity resulting in to environmental improvement all around the Project site.
5) Earning of foreign exchange for the Country as sale proceeds of CERS will be received in international currency.

Flow Chart : Additionality Scheme



Description of baseline scenario by applying methodology:
The baseline scenario " the electricity would have other wise been generated by the operation of grid connected power plants and or by the addition of new generation sources which produce additional GHG emissions as such generation would be fossil fuel based". The main source of fossil fuel being Coal is in this region.

This is met by the project activity where CPP meets 10 MW Captive Power requirements of project participant. In the absence of project activity they would have demanded and purchased 10 MW power from grid.

Hence by adding the WHR based CPP, of 10 MW, the project activity reduces the requirement from grid which otherwise would have generated 10 MW Power to meet the project participants requirement. Hence the project activity displaces the electricity generation with fossil fuels in the grid.

Refer B.2 for explanation of how baseline methodology is applied to project activity.

Description of the project activity scenario
We have described project activity in **Section A & B** and give below summary of project activity.

1. The project activity includes waste heat recovery from waste flue gases generated from GPIL'S second sponge Iron kiln through new WHRB by producing steam. The steam will be utilised in turbine to be installed to generate 10 MW power.
2. The Power will be used in house.
3. In the absence of the Project activity, the Company would have drawn equivalent of 10 MW power from CSEB grid. Hence the power plant displaces 10 MW imports from the grid which distributes mainly fossil fuel based power.
4. There will be no fuel switch in sponge iron manufacturing process after the implementation of the Project activity.
5 There is no possibility of any future change in fuel mix of power generation in grid as the coal is naturally and abundantly available fuel. In addition to this the Grid based power plants have been designed to operate on coal as Fuel. Any change in Fuel may require substantial change in the operating equipments plant and machinery hence the possibility of change in Fuel mix in the CSEB/WREB grid is not possible in near future.
6. The project activity is carried out as a part of planned increase in capacity of sponge iron production from 350 TPD to 850 TPD by adding the second Sponge Iron Kiln. Hence the project activity is treated as new facility for the added 500 TPD Sponge Iron production capacity related to Waste Heat Recovery Boiler and Power Plant.

Analysis showing why the emissions in the base line scenario likely to exceed the project activity scenario

1. Project activity has no additional GHG emissions other than the normal running of the plant.
2. Project activity produces 10 MW power without adding any GHG emissions.
3. The absence of Project activity requires the production of 10 MW power by the CSEB grid based on fossil fuels which result in emissions of 50469 tCO_2/ annum. Ref: **B.4** for supporting calculations.

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

>>

In line with methodology, the project activity is for the recovery of Waste Heat from Flue Gases for generation of steam for the electricity to be generated from CPP. The emission factor shall be based on the efficiency and carbon content of the fuel used in the base line scenario of grid power.

In the base line scenario, the electricity would have other wise been generated by the operation of grid connected power plants and or by the addition of new generation sources. The project proponent shall first proceed with the choice of grid size affected by the project activity as this point is crucial.

In line with methodology the project boundary comprises of the Waste Heat Recovery Boiler, Captive Power generating equipment, Auxiliary equipment, Power synchronising system, steam flow piping, flue gas ducts, where project participant has full Control.

Definition of Grid Electric System:

Chhattisgarh Electricity Board (CSEB) is part of Western Region grid. Hence we have selected Western Region grid generation system as our baseline grid electricity system (in line with the broad guidelines given by Executive Board).

We are required to calculate the baseline Emission Factor EFy; as combined margin (CM) consisting of the Operating Margin (OM) and Build Margin (BM) factors according to the three steps. The calculation for this combined margin must be based on data from an official source (where available) and made publicly available.

The above required calculations for baseline emission factor are part of baseline information in annexure-III. Our calculated baseline emission factor EFy is 0.9664 tCO_2 e/MWh. The baseline reduction calculated per annum is 50469 tCO_2eq.

Overview on emission sources included in or excluded from the project boundary

	Source	Gas		Justification / Explanation
Baseline	Grid Electricity generation	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project Activity	Combustion of waste gas for electricity generation	CO_2	Excluded	In absence of the Project Activity the Hot Gases would have been let to the atmosphere. As well as no extra fuel or support fossil fuel is fired.
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification

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:

>>

See Annexure –3 for baseline information.

Date of Completion	:	10/12/2005 First version, Revised on 27/3/2006 in accordance to the CDM- EB-23 dtd. 24/Feb/2006.
Name of Entity	:	Indus Financial and Technical Consultants Ltd
Name of Persons	:	Lalit Kumar Singhania R.M. Alegavi Vikas Thakur

SECTION C. Duration of the project activity / Crediting period

C.1 Duration of the project activity:

20 Years

C.1.1. Starting date of the project activity:

>>

April 2004

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

>>

20 Years and 0 months.

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

Fixed crediting period

C.2.1. Renewable crediting period

Not applicable

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

>>

Not applicable.

C.2.1.2. Length of the first crediting period:

>>

Not applicable

C.2.2. Fixed crediting period:

Fixed crediting period is 10 years

C.2.2.1. Starting date:

>>

From the date of CDM registration of project activity.

C.2.2.2. Length:

>>

10 years 0 months

SECTION D. Application of a monitoring methodology and plan

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

>>
Consolidated monitoring methodology for waste gas and/or heat and/or pressure for power generation 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 project activity meets the applicability conditions of baseline methodology, namely.

1. Project activity generates 10MW electricity from waste heat, without adding any GHG emission.
2. The 10 MW electricity produced by project activity displaces import of electricity from the grid to the plant where the project activity is implemented.
3. The 10 MW electricity Produced by project activity, displaces electricity generated from fossil fuels based power plants in the electricity grid.
4. There will be no fuel switch after completion of project activity.

There is a planned capacity expansion from 350 TPD to 850 TPD in Sponge Iron Production and hence added capacity of 500 TPD is a new facility provided within the duration of crediting period. Accordingly there is also a planned capacity expansion in the captive power generation from 18 MW (11 MW FBB + 7 MW WHRB- CDM Project Activity) to 28 MW by adding the proposed new facility of 10 MW WHRB-2 CDM Project Activity. In addition to these there is also planned production capacity expansion in Steel Making, Ferro Alloys, Pig Iron etc.

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

Project emission will be nil as the CPP is Waste Heat Recovery based with no auxiliary fuel consumption. However the following data generated inline with the requirement of monitoring methodology for monitoring steam parameters for calculating enthalpies at each STG to determine the power generated by Project activity.

ID number *(Please use numbers to ease cross-referencing to D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1.	Qi Quantitative		M^3/hr	Measured (m)	Continuously	100%	Electronic/ paper	Monitoring location: meter at plant and DCS will measure the data. Manager In-charge would be responsible for regular calibration of the meter.
		steam						
	F_1	Out let of WHRB1						
	F_2	out let of FBB						
	F_3	out let of WHRB2						
	F_4	Inlet of at TG-1						
	F_5	Inlet of at TG-2						
	F_6	Inlet of at TG-3						
	F_7	Inlet of at TG-4						
	F_8	Vent of WHRB-1						
	F_9	Vent of FBB						
	F_{10}	Vent of WHRB-2						
	F_{11}	Net Flow from WHRB-2	M^3/hr	Calculated	Once in a day	100%		

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
2.	Quantitative Qi T	Average temp STEAM (On the common header)	^0C	Measured (m)	Continuously	100%	Electronic /paper	Monitoring location: meter at plant and DCS will measure the data. Manager In-charge would be responsible for regular calibration of the meter.
	T_1	At Outlet of WHRB-1						
	T_2	At Outlet of FBB						
	T_3	At Outlet of WHRB-2						
	T_4	Inlet of TG-1						
	T_5	Inlet of TG-2						
	T_6	Inlet of TG-3						
	T_7	Inlet of TG-4						
3.	Quantitative Qi P	Average pressure of steam	Kgs/cm^2	Measured (m)	Continuously	100%	Electronic /paper	Monitoring location: meter at plant and DCS will measure the data. Manager In-charge would be responsible for regular calibration of the meter.
	P_1	At Outlet of WHRB-1						
	P_2	At Outlet of FBB						
	P_3	At Outlet of WHRB-2						
	P_4	Inlet of TG-1						
	P_5	Inlet of TG-2						
	P_6	Inlet of TG-3						
	P_7	Inlet of TG-4						

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
4.	Quantitative Qi H	ENTHALPIES	KCal	Calculated (c)	Calculated every day	100%	Electronic /paper both	Calculated from the above measured parameters and using steam tables.
	QiH_1	Existing System (WHRB-1 & FBB)	KCal	Calculated (c)	Calculated every day	100%	Electronic /paper both	Calculated by multiplying steam consumed for electricity generation by existing system and enthalpy of steam K Cal/Kg
	QiH_2	New WHRB-2 Project Activity	KCal	Calculated (c)	Calculated every day	100%	Electronic /paper both	Calculated by multiplying steam consumed for electricity generation by new WHRB-2 project activity and enthalpy of steam K Cal/Kg

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

Left blank as project activity is waste heat recovery based CPP with no auxiliary fuel being used . Project emission will be nil.

PEy = 0

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 emissions are assumed to be Nil as the CPP is based on waste heat recovery from waste flue gases with no auxiliary fuel being used.

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
5. E_{GEN}	Quantitative	Total electricity generated	MWH /year	Measured (m)	Continuously/ annum	100%	Electronic / Paper	Monitoring location: meter at plant and DCS will measure the data required for this calculation. Manager In-charge would be responsible for regular calibration of the meter.
6. E_{AUX}	Quantitative	Auxiliary electricity Consumption Location i) At generating plant	MWH /year	Measured (m)	Continuously/ annum	100%	Electronic / Paper	Monitoring location: meter at plant and DCS will measure the data required for this calculation. Manager In-charge would be responsible for regular calibration of the meter.
7. E_{NET}	Quantitative	Net electricity generated from WHRB project activity	MWH /year	Calculated	Continuously /annum	100%	Electronic / Paper	Calculated from the above measured parameters. Algorithm for project emission calculation given in baseline methodology. E_{GEN} - $E_{AUX,}$ emission calculations as per baseline methodology.

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
8. EF_y	Emission factor	CO_2 emission factor of the grid	tCO_2eq/ MWH	Calculated (c)	Yearly	100%	Electronic / Paper	calculated weighted average of OM & BM emissions factors.
9. $EF_{OM,y}$ simple	Emission factor	CO_2 operating margin emission factor of the grid	tCO_2eq / MWH	Calculated (c)	Yearly	100%	Electronic/ Paper	Calculated as indicated in the relevant OM baseline method above.
10. $EF_{BM,y}$	Emission factor	CO_2 Build margin emission factor of the grid	tCO_2eq / MWH	Calculated (c)	Yearly	100%	Electronic/ Paper	Calculated as per baseline method [Σi Fi,y*COEFi] / [Σm GENm,y] over recently build power plants defined in the baseline methodology.
11. F i,j,y	Fuel Qty.	Amount of each fossil fuel Consumed by grid and by importing plants/ sources	Tonnes	Measured (m)	Yearly	100%	Electronic/ Paper	Obtained from WREB/ CEA documents.
12. COEF i,k	Emission factor Coefficient	CO2 emission Coefficient for each by grid and by importing plants/ sources	tCO_2eq / t of fuel	Calculated	Yearly	100%	Electronic / Paper	Obtained from CEA / IPCC.

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
13. GEN j,y	Electricity Qty.	Electricity generation / import from CSEB grid	MWH /yr	Measured (m)	Yearly	100%	Electronic / Paper	Obtained from CEA and WREB documents.

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

>>
We have followed the approved baseline methodology ACM0004 for formulas used is estimating base line emissions:

A base line emission factor EF_Y is calculated as combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors according to following three steps. Calculations for the combined margin are based on the data from following official sources.

1) Western Regional Electricity Board
2) CEA data
3) IPCC guide lines.

Step –1. Calculate the operating margin emission factor(s) ($EF_{OM,y}$) based on (a) simple OM

(a) **Simple OM.**

The Simple OM method (a) is used where Low Cost –must run resources Constitute less than 50% of Western Region grid generation in (1) average of five most recent years or (2) based on long term normal by hydroelectricity production.

Simple OM emission factor ($EF_{OM,simple, Y}$) is calculated as the generation –weighted average emission per electricity unit (t CO_2 / MWH) of all generating sources serving the system, not including low operating cost & must run power plants.

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

Where,

$F_{i,j,y}$ is the amount of fuel $_i$ in tonnes consumed by relevant power sources $_j$ in years $_y$.

$_j$ refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants and including import to the grid.

$COEF_{i\,j\,y}$ Is the CO_2 emission coefficient of fuel $_i$ (t CO_2/t of fuel), taking into account the carbon content of fuel used by relevant power source $_j$ and the percent oxidation of the fuel in year(s) y and

$GEN_{j,y}$ Is the electricity (MWh) delivered to the grid by sources $_j$

The CO_2 emission coefficient $COEF_i$ is obtained as

$$COEF_i = NCV_i \cdot EF_{CO2,i} , OXID_i$$

Where,

NCV_i is the net calorific value TJ /tonnes of fuel i,

$OXID_i$ oxidation factor

$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel i t CO_2 eq / tonnes of fuel

Simple OM emission factor is calculated by a 3 year average based on the most recent statistics available at the time of PDD submission.

Step –2 **calculate the Build Margin emission factor ($EF_{BM,y}$)**

as the generation-weighted average emission factor (tCO_2eq/MWh) of a sample power plants m, is as follows:

$$EF_{BM,Y} = \frac{\sum F_{i,m,y} \ COEF_{i,m}}{\sum GEN_{m,y}}$$

$F_{i,m,y}$ $COEF_{i,m}$ and $GEN_{m,y}$ are analogous to the variables described for the simple OM method in step –1 above for plants m.

The sample group m Consists of plants capacity additions in the electric system that comprise 20% of Western Region Grid generation (in MW) and that have been built most recently.

Step –3

Calculate the baseline emission factor EF_y
as the weighted average of the operating margin emission factor ($EF_{OM,y}$) and build margin emission factor ($EF_{BM,y}$).

$EF_y = w_{OM}\ EF_{OM,y} + w_{BM}\ EF_{BM,y}$
By default, we have Considered $w_{OM} = w_{BM} = 0.5$
$EF_{OM,y}$ & $EF_{BM,y}$ are from step 1 & step 2

Leakage

There is no leakage in the project activity

Emission Reductions

The project activity mainly reduces CO_2 through substitution of grid electricity generation with fossil fuel fired power plants by WHRB based electricity.

ER y = BE y – PE y – Ly

Where,

ER y	=	Emission reduction by the project activity during a given year y.
BE y	=	Baseline emissions by the project activity during a given year y.
PE y	=	Project emission by the project activity during a given year y.
Ly	=	Leakage by the project activity during a given year y.

Where the baseline emissions
BE y in tCO2 = EF y X EG y

EG y = $E_{GEN} – E_{AUX}$ = Net electricity supplied by project activity
PE y= 0 The project emissions are assumed to be Nil as the CPP is based on waste heat recovery from waste flue gases with no auxiliary fuel being used.
Ly = 0 emissions due to leakage

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

This section has been left blank. The project emissions are assumed to be Nil as the CPP is based on waste heat recovery from waste flue gases with no auxiliary fuel being used. The emission reduction is achieved by displacing grid power. This calculation of emission reduction will be done according to approved methodology.

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

This section has been left blank

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

>>

The project emissions are assumed to be Nil as the CPP is based on waste heat recovery from waste flue gases with no auxiliary fuel being used.

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

In line with baseline methodology, no leakage is considered; hence the tables are left blank.

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

>>

Not Applicable

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.)

>>

Emission Reductions

The project activity mainly reduces CO_2 through substitution of grid electricity generation with fossil fuel fired power plants by WHRB based electricity.

$$ER\ y = BE\ y - PE\ y - Ly$$

Where ,

ER y = Emission reduction by the project activity during a given year y.
BE y = Baseline emissions by the project activity during a given year y.
PE y = Project emission by the project activity during a given year y.
Ly = Leakage by the project activity during a given year y.

Where the baseline emissions

BE_y in $tCO_2 = EF_y \times EG_y$

$EG_y = E_{GEN} – E_{AUX}$ = Net electricity supplied by project activity

$PE_y = 0$ The project emissions are assumed to be Nil as the CPP is based on waste heat recovery from waste flue gases with no auxiliary fuel being used.

$L_y = 0$ emissions due to leakage

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.
D.2.1 Option-1 (1 to 4)	Low	This data will be used for calculating electricity generated by project using steam enthalpies.
D.2.1.3 (5 to 7)	Low	This data will be used for calculation of electricity generated by project activity.
D.2.1.3 (8 to 9)	Low	This data is collected hence no need QA procedures.
D.2.1.3 (10 to 12)	Low	This data will be required for calculation of baseline emission and will be obtained through published and official sources.

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

>>

(A) Purpose

To define the procedures and responsibilities for GHG Performance, monitoring, measurement and reporting of data and dealing with uncertainties.

(B) Scope

This procedure is applicable to 10 MW waste heat based i.e. WHRB-2 power project of GPIL, India.

(C) Responsibilities

Shift Engineer (Operations): Responsible for reporting hourly and eight hourly data of the flue gas available from sponge iron kiln, steam generated from WHRB-1, WHRB-2 and FBB boilers, steam fed to turbines, parameters of steam and flow meter reading of the captive power plant. The report is then sent to the Manager (O & M) for his review.

Manager (O&M) : Responsible for reviewing the monitored parameters on an hourly based and presenting a daily executive summary report, duly signed by himself, to the General Manager (Plant).

Shift Engineer (Electrical): Responsible for taking meter reading for electricity generation and wheeling shift-wise. The report is then sent to the Manager (E&I) for his review on a daily basis.

Manager (E&I): Responsible for reviewing the monitored parameters shift-wise and presenting a daily executive summary report, duly signed by himself, to the General Manager (Plant).

General Manager (Plant): Responsible for summarizing data of Electrical, Mechanical, Process (/operation) Departments and report the same to the Vice President (Power) and CMD (GPIL) on a daily basis.

CSEB personnel: Responsible for monitoring the total power generated by GPIL CPP and certifying the same jointly with GPIL on a monthly basis, for cess assessment.

Serial No.	Activity
1.0	**GHG Performance Parameter**
1.1	The monitoring protocol requires GPIL to monitor the following GHG Performance parameters for estimating the emissions reductions from the waste heat based CPP: • Gross generation of electricity by the CPP • Auxiliary consumption • Steam availability from WHRB-1, WHRB-2 and FBB boiler. • Temperature and pressure of steam from WHRB and FBB boiler. • Net quantity of steam available from the waste heat recovery boiler for electricity generation CPP. • Net electricity generation from waste heat recovery.
2.0	**Metering System**
2.1	The metering system for the waste heat based CPP consist of

	• External Metering System of CSEB for metering the net export (wheeling) of power (Main meter) • External metering system of CSEB for metering total generation from each TG Set. • In house metering system of GPIL (for metering the generation of power, auxiliary consumption, wheeling through CSEB grid) • Flow meters for monitoring steam flow from FBB, WHRB-1,WHRB-2 and flow meter at vent of WHRB-1, FBB & WHRB-2. • Flow meter for steam inlet to turbine TG1, TG2 TG3 and TG4. • Temperature gauge for WHRB-1, WHRB-2 and FBB boiler steam and at inlet of TG1, TG2, TG3 & TG4. • Pressure gauge for WHRB-1, WHRB-2 and FBB boiler steam and at inlet of TG1, TG2, TG3 & TG4.
2.2	**External Metering System of CSEB** The external metering system of CSEB consists of three metering units. The external export meter is installed at Gate No.2 around 1 KM from control room. The 2 TG meters are located in the TG room itself. They are used to monitor GPIL's net electricity export (wheeling) to CSEB grid and total generation from the CPP. These meters are maintained and calibrated by CSEB. All these meters are sealed by CSEB.
2.3	**In house Metering System of GPIL** GPIL has an in-house metering system, which monitors the overall performance of the waste heat based CPP. The metering system mainly comprises of three meters. • 4 in-house generation meters- One for each TG set. • In-house Auxiliary consumption meter. (two) • In-house export meter (Check meter) • In-house captive consumer meters. The in-house generation meters (or the Energy Meter) are micro-processor based metering device which monitor the net unit of auxiliary electricity consumed by GPIL's CPP. The reading of this meter is used to cross-check the reading of the External Metering System CSEB. The In-house export meter in the incomer breaker from the switchyard within 1 KM from the control room. The reading of this meter is used to cross-check the reading of the external metering system of CSEB. In-house captive consumer meters (or the Kilowatt Hour meter) are a micro-processor based metering device which gives data on consumption by various consuming units in GPIL.
3.0	**Calibration of the Metering System**
3.1	All the metering devices are calibrated at regular intervals so that the accuracy of measurement is ensured all the time. The meters recording total generation is calibrated by CSEB with a pre-calibrated meter. The others are calibrated internally as per suppliers

	calibration schedule following the standard procedures for calibration.
4.0	**Reporting of the Monitored Parameters/ Authority and Responsibility of monitoring and reporting**
4.1	Metering System of CSEB The CSEB personnel and GPIL personnel jointly read the CSEB exported power and generation metering system for recording the net electricity wheeled through CSEB grid and the total generation from the CPP on the last day of every month and keep the complete and accurate records for proper administration. The accuracy of the main meter reading is substantiated by the check meter reading. In the event that the main metering is not at service, then the check meter shall be used. A monthly report is prepared based on these joint meter reading, which is sent to the Vice President (Power) of GPIL at Raipur, Chhattisgarh for his review. The monthly invoice against the electricity exports (wheeled) to CSEB grid are based on the monthly reports as raised by GPIL on the consumer group companies. A cess demand note over generation is raised by CSEB every month on the basis of these monthly reports. The Shift Engineer (Electrical) takes daily reading (at 6.00 AM) of the Main and Check meters of the external metering system and keeps the complete and accurate records in the CSEB reading book (maintained at the plant) for proper administration. The reading are verified by the Manager (Electrical and Instrumentation) on a daily basis and sent to the General Manager (Plant) at the Administrative Building in the plant for his review and for preparing the daily report.
4.2	**In-house Metering System of GPIL** The Shift Engineer (Electrical) monitors hourly and eight hourly data on total generation, auxiliary consumption, net electricity available. The hourly data are recorded in the generation log book and the eight hourly data are recorded in the plant log book. The complete and accurate records in the plant log book are signed by the Shift Engineer (Electrical). Both of these reports are sent to the Manager (Electrical & Instrumentation) for his review on a daily basis. On the basis of the reported parameters, a complete and accurate executive daily summary report is prepared and signed by the Manager (Electrical & Instrumentation) and sent to the General Manager (Plant) for proper administration. The flow meter reading, temperature and pressure gauge and DCS will measure the respective parameters and reporting is done shift wise by shift in-charge (operations) based on the online measurements.
5.	**Uncertainties and Adjustments:**
5.1	The hourly, eight hourly, daily and monthly data are recorded at various points as stated above. Any observations (like inconsistencies of report parameters) and/or discrepancies in the operation of the power plant will be documented as “History” in the

	daily report prepared by the General Manager (Plant) along with its time of occurrence, duration and possible reasons behind such operational disruptions. Necessary corrective actions will be undertaken at the earliest. Any discrepancies in the Main reading (for example, difference between main meter and check meter reading or extreme deviation in the net generation figure from that reported by the In-house Meter of GPIL), if identified, will immediately be brought to the notice of CSEB. Corrective actions to be undertaken at the earliest after identification of reason of such discrepancy. Furthermore, as a safety measure, the total power generating system is equipped with an Automatic Alarming System which gives a prior indication of any fluctuations in the operating parameters of the power plant thereby enabling the operators to take necessary preventive measures. These measures will be undertaken in order to detect and minimize the uncertainty levels in data monitoring.
6.0	**Experience and Training**
6.1	All the Shift Engineers (Electrical and Instrumentation, Operations) are qualified engineers/ technologists. All the operators of the boiler power plant are IBR certified and NPTI certified engineers, and they also undergo an exhaustive on-the-job training program including plant operations, data monitoring and report preparation.
6.2	**Emergency Preparedness Plan** The total power generating system of the waste heat based CPP is equipped with an "Automatic Alarming System" which helps the operators to take necessary preventive actions before any kind of non-functioning of the power plant results in. GPIL. CPP has a fire fighting system in place. In addition GPIL has standard procedures for tackling emergencies arising from • Blackout • Low boiler drum level/ low feed water level • High flue gas temperature from sponge iron kiln. • Load throw off • Boiler Tube leakage. Boiler tripping at alarm systems.
(f)	**Reference** Project Design Document, maintenance manuals and standard OEM procedures.
	Records

	1. Generation Log Book, maintained Electrical & Instrumentation Department at site, containing hourly data for all the In-house Metering System. 2. Plant Log Book, maintained by Electrical & Instrumentation Department at site, containing eight hourly data for all the In-house Metering System. 3. Daily Executive Summary (submitted to the General Manger (Plant), prepared by Electrical & Instrumentation Department at site containing daily data for all the in-house metering system and record of any History with details. 4. CSEB Reading Book, maintained by Electrical & Instrumentations Department at site, consisting of daily export of power to CSEB GPIL's power plant. 5. Daily report containing the performance parameters of the power plant and record of any history with details, maintained at site with a copy being sent to the Head Office of the GPIL at Raipur, Chhattisgarh. 6. Monthly Report on net quantity of electricity generated at GPIL's Plant and cess returns submitted by GPIL on generation archived at site with a copy being sent to the Head Office of GPIL at Raipur, Chhattisgarh. 7. Calibration Certificate of the steam flow meters of GPIL maintained at site.

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

>>

The monitoring methodology followed is approved monitoring methodology ACM 0004.

Preparation of this documents has been done by "Indus Financial and Technical Consultants Ltd.", whose address is

Shri Lalit Kumar Singhania, Shri R.M. Alegavi & Shri Vikas Thakur
Indus Technical and Financial Consultants Ltd.
205, Samta Colony, In front of Shikapuri Panchayat Bhawan.
Raipur City , Chhattisgarh State . 492001. INDIA
Phone : 0771-2255186 Fax : 0771-2254188, Email : indusryp@satyam.net.in , Mobile: 094252-08189, 093011-93400

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

>>

Project activity is based on waste heat based WHRB and steam turbine CPP. The project activity does not use any back up power based on fossil fuels within the project boundary.

Hence the project activity does not generate any additional GHG emissions.

PE_y = 0

E.2. Estimated leakage:

>>

Zero.

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

>>

$E_1 + E_2 = Zero$

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

>>

$BE_y = EG_y . EF_y$

EG_y is the net electricity generated by the project activity in the year in MWh supplied to the manufacturing facilities of the company or supplied for export to the grid..

EF_y is CO_2 base line emission factor for the electricity displaced due to the project activity during the year t CO_2 / MWH.

BE_y = $EG_y . EF_y$
= 50652 X 0.9964
= 50469.6 or Say = 50469 t CO_2 /annum

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

>>

E4 – E3 = E4-0 =E4.
= 50469 t CO_2 /annum

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

>>

Year	Estimation of Project activity emission reduction tonnes of CO_2eq	Estimation of baseline emission reduction tonnes of CO_2eq	Estimation of leakage tonnes of CO_2eq	Estimation of emission reduction tonnes of CO_2eq
2006	0	50469	0	50469
2007	0	50469	0	50469
2008	0	50469	0	50469
2009	0	50469	0	50469
2010	0	50469	0	50469
2011	0	50469	0	50469
2012	0	50469	0	50469
2013	0	50469	0	50469
2014	0	50469	0	50469
2015	0	50469	0	50469
				504690 t CO_2 / Credit Period

SECTION F. Environmental impacts

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

>>
The Project activity is to produce 10 MW power based on waste heat recovery based steam generation (WHRB) and steam turbines. There are no additional GHG emissions other than the existing GHG emissions in the absence of project activity.

The installation of WHRB and CPP requires approvals of IBR (Indian Boiler Regulation) and Chhattisgarh Environment Conservation Board (CECB) and both the approvals will be received before the commissioning of project activity.

Environmental impact is negligible as the project activity benefits the local, regional and global environment by,

1. Reducing the thermal pollution which could have been caused by emitting waste gases at 950^0C into atmosphere. Project activity recovers the waste heat and save; energy and reduces thermal emission by controlling gas temperature at 200^0C.
2. Generates electricity without adding any additional GHG emissions.
   i) Reduces power demand on grid and indirectly saves the impact of air emission in thermal power stations.
   ii) Avoid installation of Coal based CPP which could have generated additional GHG emission.
   iii) CSEB State grid has almost 37% T&D losses. The power generated by new project activity will be used for in house activity will be used for in house requirement and consumption without any T&D losses as the location of power generation is in the same premises.
3. Waste water generation is minimising as technology employed is closed circuit usage of air cooled condenser in STG. The generated waste water is used for plantation to create green belt.
4. Noise level from equipments is kept within legal limits.
5. The project will not generate any Fly Ash due to Power generation.
6. The proposed ESP shall remove the ash from flue gases which will be collected in Ash Hopper. This ash will be given free of cost to cement plants and brick manufacturers for further Economics benefits and use. The ash used for production of bricks saves the valuable productive soil, also it reduces the Air Pollution caused by the conventional brick kilns, due to the coal burning. The Ash consumed in Cement making reduces the limestone and coal consumption, thus natural resources are saved.

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:

>>
As enumerated in F1, No adverse impact on environment will be there due to project activity.

However EIA study was conducted to meet the statutory condition.
EIA Study highlights the following:

Noise Pollution

Equipments like Boiler and STGs have been provided with noise depressing facilities to dampen and to reduce the noise level to 50 dB level in the nearby villages. In the plant the noise level is kept below 90dB.

Thermal Pollution:

In business as usual scenario, the flue gases let out would be at 950^0C causing considerable thermal pollution.

The heat is recovered in the boiler and the flue gases are let out by stack of 70 m height at 200^0C and hence thermal pollution is reduced considerably.

Air emission:

An ESP provided at the outlet of boiler effectively reduces the fugitive dust level to 100 mg/nm^3 while acceptable legal standard to 150 mg/nm^3 .

Impact on Water environment

Blow down water is used for plantation. Sources of waste water are DM Plant and Blow down.

All the waste water will be neutralized before using for plantation.

Monitoring of waste water will be done to limit pH, BOD and COD levels within the stipulated levels.

No discharge will be there outside the premises. Hence due to the zero discharge condition, no adverse impact will be there in the water regime.

Solid waste management

Ash collected from bottom of hopper of ESP is transported to Ash Silo equipped with bag filters to ensure clean air.

Ash collected is then supplied to cement manufacturing/ brick manufacturing.

Safety Management

To ensure safe working conditions:

1) All moving parts have been provided with guards/ hoods.
2) Insulation of all hot parts is done.
3) Full fledge maintenance department to ensure the healthy condition of equipments.
4) A disaster management plan already exists to handle crisis situation.

All efforts will be done to create clean environment.

Parameters like Noise, Fugitive Emission as well as point source emissions will be monitored regularly.

Conclusion:

Project activity is environment friendly and creates employment and other benefits and promotes sustainable developments.

SECTION G. Stakeholders' comments

>>

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

>>

GPIL identifies the following as stake holders to keep the transparency in the operational activity of the project promoter and thereby meeting local/ environmental regulations.

1) Local Authority (Member of Legislative Assembly of Chhattisgarh)
2) Local authority of Village –Siltara and Tanda.
3) Chhattisgarh State Electricity Board (CSEB)
4) Chhattisgarh Environment Conservation Board (CECB)
5) Chhattisgarh State Electricity Regulatory Commission (CSERC)
6) Chhattisgarh Renewable Energy Development Agency (CREDA)
7) Chhattisgarh State Industrial Development Corporation (CSIDC)
8) Non- Govermental Organisations.
9) Consultants
10) Equipment suppliers.

G.2. Summary of the comments received:

>>

GPIL management apprised the representatives of village Panchayat of village-Siltara and Tanda about the project activity. The members of Panchayat appreciated and had expressed their no objection for project activity.

Similarly GPIL management apprised MLA regarding the project activity who also appreciated and expressed no objection for the project activity.

Permission have been sought from the State agencies like CSEB, CECB, CSERC, CSIDC etc. wherever required legally and have been received and other State agencies have been apprised of the project activity

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

>>

The relevant comments and important clauses mentioned in the project documents/ Detailed project report, Environment clearances were considered while preparation of CDM Project Design Document. GPIL management representatives met various stake holders for apprisal regarding project activity and sought the support.

All the stake holders appreciated the energy efficient environment friendly project activity which has sustainable contribution to the development.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Godawari Power and Ispat Ltd.
Street/P.O. Box:	-
Building:	G-9, Hira Arcade, Pandari
City:	Raipur
State/Region:	Chhattisgarh
Postfix/ZIP:	492001
Country:	INDIA
Telephone:	91-771-4057600
FAX:	91-771-4057601
E-Mail:	lkp46@sify.com
URL:	www.gpilindia.com
Represented by:	
Title:	Executive Director
Salutation:	Mr.
Last Name:	Prasad
Middle Name:	-
First Name:	L.
Department:	Raw Material
Mobile:	+91 98271 30743
Direct FAX:	
Direct tel:	
Personal E-Mail:	lkp46@sify.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is available from Annexure-I country.

Annex 3

BASELINE INFORMATION

Base line information (sources of information)

For, 2004-05

S.No.	Parameter	Source
1	**Individual Plant Capacity & Generation, Fuel consumption and Auxiliary consumption**	1) Western Region Annual Report 2004-05 2) Review of Performance of Thermal Power Station 2004-05, 2003-04, 2002-03, 1997-98 of CEA. 3) Review of Performance of Hydel Power Station 2003-04, 2002-03 of CEA 4) General Review of 2005 & 2002-03 CEA. 5) Nuclear Power Corporation Report 6) Tariff Order for TPC-FY 2003-04 & FY 2004-05 for Trombay Power Station
2	**Net Calorific Value (NCV) for Coal/ Lignite**	Review of Performance of Thermal Power Station 2004-05 and General Review 2005 and General Review 2002-03 of CEA.
3	**EF_{CO2}, OXDi and NCV for Gas, Diesel, Lignite (Lignite for 2004-05 only)**	IPCC Guidelines.

Base line Information (Baseline Calculations)

Definition of Electric System:

Chhattisgarh Electricity Board (CSEB) is part of Western Region grid. Hence we have selected Western Region grid generation system as our baseline grid electricity system. As per the Executive Board requirement about the choice of the Grid, we have selected WREB Grid.

We are required to calculate the baseline Emission Factor EFy; as combined margin (CM) consisting of the Operating Margin (OM) and Build Margin (BM) factors according to the following three steps. The calculation for this combined margin must be based on data from an official source (where available) and made publicly available.

Step – 1 : Calculate the Operating Margin Emission Factor $EF_{OM,y}$ based on One of the four following methods:

[a] Simple OM or
[b] Simple adjusted OM or
[c] Dispatch data analysis OM or
[d] Average OM

As dispatch data analysis is not available, project participant may use simple OM method [a] can only be used where low-cost/ must run recourses constitute less than 50% of total grid generation in ; 1) average of the five most recent years, or 2) based on long term normal for hydroelectricity production.

We have opted for Simple OM method as low cost / must run resources constitute less then 50% of the total grid generation in the last 5 years. The Simple OM emission factor can be calculated using 3 years average, based on most recent statistics available at the time of PDD submission or the year in which the project generation occurs, if $EF_{OM,y}$ is updated based on ex-post monitoring. We have selected past 3 years average, based on most recent statistics available for calculating EF_{OMy}.

The generation figures are based on the official source of Western Regional Electricity Board, Central Electricity Authority and published Thermal /Hydel Power Station Performance Reviews, and Annul General Review.

For calculating Simple OM we have followed the following procedures:

1)	**IPCC guidelines figures which are used for calculation** (Based on IPCC default Carbon content factor Table No. 1.1 in Revised IPCC guidelines, Vol.3				
	Fuel	**NCV(TJ/t)**	**OXDi**	**EF_{CO2} (tCO2/TJ)**	**Calculation for EF_{CO2} (tCO2/TJ)**
	Coal	0.01998	0.98	096.07	(26.2 (carbon content factor for sub.bit. Coal X 44/12)
	Lignite	0.0098	0.98	101.20	(27.6 (carbon content factor for sub.bit. Coal X 44/12)
	Gas	0.043	0.995	056.1	(15.3 (carbon content factor for sub.bit. Coal X 44/12)
	Diesel Oil	0.04333	0.99	074.0666667	(20.2 (carbon content factor for sub.bit. Coal X 44/12)
	Naptha	0.04501	0.99	073.3333333	(20.0 (carbon content factor for sub.bit. Coal X 44/12)

2. (A) Calculation of EF_{OM} simple for Coal based power stations.

Coal based Generation for Western Region	Net Gen.(MU) 2004-05	2003-04	2002-03
Chhattisgarh	7132.13	**6899.77**	6980.96
Madhya Pradesh	13621.03	**11980.94**	13396.12
Gujrat	23701.76	**23068.03**	24863.00
Maharashtra	51353.40	**49605.49**	48278.32
Goa	0.00	**0.00**	0.00
NTPC Central Sector Units	32518.38	**29745.02**	30722.48
Imported Electricity From Central Sector	8346.48	**1794.07**	1281.52
Total ::	136673.17	**121299.25**	125522.40
Calculated Weighted Average of EF_{OM} for year based on calculated EF_{OM} for individual plant. (tCO_2/MWh)	1.164582177	1.147756138	1.228488461
Auxiliary Oil consumption (Tonnes)	246011.71	221275.08	163952.10
Calculated EF_{OM} for 2004-05 based on total oil consumption and power generation.	0.005718988	0.005718988	0.004149946
Weighted Average for EF_{OM} simple coal (including Auxi. Oil consumption)	**1.170301165**	**1.153475126**	**1.232638407**
Weighted Average for Three Years (EF_{OM+} simple)			***1.185184776***

* NCV values for coal for all the three year have been based on Official figures available in the Thermal Reviews and General Reviews of CEA

2. (B) Calculation of EF_{OM} simple for Gas based Power Station.

Gas based Generation for Western Region	Net Gen.(MU) 2004-05	2003-04	2002-03
Chhattisgarh	0	**0**	0
Madhya Pradesh	0	**0**	0
Gujrat	13104.754	**7969.750**	5358.356
Maharashtra	5428.280	**4939.526**	4646.000
Goa	13.8500	**183.924**	251.252
NTPC Central Sector Units	6700.630	**6464.131**	6973.600
Imported Electricity From Central Sector	1.4030	**0.341**	0.244
Total ::	25248.917	**19557.333**	**17229452.10**
Calculated Weighted Average of EF_{OM} for year based on calculated EF_{OM} for individual State, separately for Naptha, Gas & Auxiliary fuel consumption (tCO_2/MWh)	**0.49358**	0.53445	0.56950
Weighted Average for Three Years (EF_{OM+} simple)			***0.527549722***

3 Calculation of combined EF_{OM} simple for Three year average for Coal and Gas

Weighted Average for Three Years (EF_{OM+} simple) for Coal	***1.185184776***
Weighted Average for Three Years (EF_{OM+} simple) for Gas	***0.527549722***
Percentage of Coal based power	***86.13%***
Percentage of Gas based power	***13.87%***
Combined Weighed Average = (Percentage of Coal based Power X EF OM for coal)+ (Percentage of Gas based power X EF OM simple Gas)	**1.09428**

Step – 2 Calculate the Build Margin emission factor $EF_{BM,y}$:

Project participant are required to choose one of the following two option:

Option -1 **:**
Calculate the Build Margin emission factor $EF_{BM,y}$ *ex-ante* based on the most recent information available on the plant already built for sample group *m* at the time of PDD submission. The sample group *m* consist either of 5 power plants that have been built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. The project participant should use that sample group that comprises the larger annual generation.

Option -2 **:**
For the first crediting period, the Build Margin emission factor $EF_{BM,y}$ must be updated annually *ex-post* for the year in which the actual project generation and associated emission reduction occurs. For subsequent crediting period $EF_{BM,y}$ should be calculated as *ex-ante* as described in option-1 above. The sample group *m* consist either of 5 power plants that have been built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. The project participant should use that sample group that comprises the larger annual generation.

GPIL have opted for Option-1, which require following:

1) Calculate the Build Margin emission factor $EF_{BM,y}$ *ex-ante* based on the most recent information available on the plant already built for sample group *m* at the time of PDD submission. The sample group *m* consist either of 5 power plants that have been built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. The project participant should use that sample group that comprises the larger annual generation.
2) Accordingly GPIL have worked sample-1 which includes five most recent plants which have total installed capacity of 625 MW.
3) Sample-2 was worked out taking into consideration 20% system generation increase based on 2004-05 system generation and have selected the plant who have contributed to this increased generation. The following table for sample two provide the key information and data used. The capacity addition works out to be 9049.15 MW.

Hence sample-2 is larger than sample-1, sample-2 has been selected for calculating the Build Margin EF_{BM} factor.

S.No.	Name of Power Plant	Dt. of Com.	Addition in Capacity	Increase Gen.	Gross Gen 04-05	EF OM (tCO2/MWH) (2004-05)	tCO2 of Increased Gen.
	Coal Based Units						
1	Sanjay Gandhi - 3	28-Feb-99	210	1553.15	1553.15	0.9707	1507.64946
2	Sanjay Gandhi-4	23-Nov-99	210	1474.04	1474.04	0.9707	1430.857039
3	Gandhi Nagar-5	17-Mar-98	210	1560	1560	1.1013	1718.028486
4	Wanakbori-7	31-Dec-99	210	1656.97	1656.97	1.15747	1917.899493
5	Surat Lignite	1-Nov-99	125	858.382	858.382	1.21	1035.131092
6	Surat Lignite		125	946.53	946.53	1.21	1141.429611
7	K'Kheda -II -3	31-May-01	210	1603.6	1603.6	1.32748	2128.752965
8	K'Kheda -II -4	7-Jan-01	210	1493.73	1493.73	1.32748	1982.902323
9	Chandrapur -7	1-Oct-97	500	3376.25	3376.25	1.28983	4354.772692
10	V'Chal STPS-7	1-Mar-99	500	3831.94	3831.94	1.10759	4244.20613
11	V'Chal STPS-8	1-Feb-00	500	3858.53	3858.53	1.10759	4273.656863
12	Akrimota Lignite	31-Mar-05	125	0	0	0	0
	Total for Coal Based Unit		3135	22213.122	22213.122		**25735.28615**
	Gas Based Unit						
1	Dhuvaran CCPP+ GT	22-Sep-03	79.6	557.97	700.97	0.50266	280.4694196
2	GPEC	1998	138	737.92	737.92	0.50266	370.9231574
3	GPEC		138	789.71	789.71	0.50266	396.9559391
4	GPEC		138	764.51	764.51	0.50266	384.2888972
5	GPEC						
			241	1341.48	1341.48	0.50266	674.3088643
6	GIPCL GT-4	26-Aug-97	160	1133.207	1133.207	0.50266	569.6182762
7	GIPLC ST-2	18-Nov-97	54				
8	GSEG (Hazira)	30-Sep-01	52	387.36	387.36	0.50266	194.7105299
9	GSEG (Hazira)	16-Oct-01	52	377.28	377.28	0.50266	189.6437132
10	GSEG (Hazira)	31-Mar-02	52.1	386.23	386.23	0.50266	194.1425237
11	Dabhol	13-Mar-99	740	0	0	0.45572	0
12	RSPCL	14-Aug-00	48	138.5	138.5	0.45572	63.11790098
	Total for Gas		1892.7	6614.167	6757.167		3318.179222

S.No.	**Name of Power Plant**	Dt. of Com.	Addition in Capacity	Increase Gen.	Gross Gen 04-05	EF OM (tCO2/MWH) (2004-05)	tCO2 of Increased Gen.
	Hydro Power Units						
1	Gangrel	4-Feb-04	10	7.52	7.52	0	0
2	R.P. Sagar		86	188.64	188.64	0	0
3	J.Sagar		49.5	140.52	140.52	0	0
4	Bansagar-II (Silpara)	28-Aug-02	15	33.45	33.45	0	0
5	Bansagar-II (Silpara)	9-Jan-02	15	34.89	34.89	0	0
6	Bansagar-II (Deolondh)	2002	20	24.8	24.8	0	0
7	Bansagar-II (Deolondh)	2001	20	24.97	24.97	0	0
8	Bansagar-II (Deolondh)	2001	20	26.76	26.76	0	0
9	Rajghat-1	15-Oct-99	7.5	18.89	18.89	0	0
10	Rajghat-2	29-Sep-99	7.5	11.03	11.03	0	0
11	Rajghat-3	11-Mar-99	7.5	13.85	13.85	0	0
12	Mini-Micro		3.3	0	0	0	0
13	Sardar Sarovar	2-Jan-05	256.5	150.07	150.07	0	0
14	Indira Sagar	23-Mar-05	1000	1331.87	1331.87	0	0
15	Kadana	2-Jan-98	60	97.54	97.54	0	0
16	Sardar Sarovar	10-Apr-04	72	42.13	42.13	0	0
17	Koyna -IV	20-Jun-99	250	529.6	529.6	0	0
18	Koyna -IV	25-Nov-99	250	268.52	268.52	0	0
19	Koyna -IV	3-Mar-00	250	721.3	721.3	0	0
20	Koyna -IV	5-Mar-00	250	225.85	225.85	0	0
21	Vautarana DPH		1.5	1.54	1.54	0	0
22	Warna	16-Sep-98	16	57.27	57.27	0	0
23	Pench		53.3	75.86	75.86	0	0
24	Dimbhe	17-Oct-98	5	9.11	9.11	0	0
25	Surya RBC	1-Jan-99	0.8	0	0	0	0
26	Terwanmedhe		0.2	0.09	0.09	0	0
27	Sardar Sarovar	2-Jan-05	121.5	71.09	71.09	0	0
28	Tata Hydro			241	1432	0	0
29	Bhira	1997	18	0	0	0	0
30	Aravelam	4-Feb-04	0.05	0	0	0	0
31	RSPCL (Injection)		48	138.36	138.36	0	0
	Total for Hydro		2914.15	2914.15	5677.52	0	0
	Grand Total ::		**7941.85**	**31741.439**	**34647.809**		
		20% increase in System Gen.			33901.0344		

Build Margin = E_{BM} = **0.83853687**

Step-3 Base line emission factor

$EFy = W_{OM} . EF_{OM,\ y} + W_{BM} . EF_{BMY}$

BY DEFAULT

$W_{OM} = W_{BM} = 0.5$

EFy = 0.9664 t CO_2 eq/ MWH .

EF (Emission Factor)	t CO_2 eq/ MWH	
Simple OM	**1.09428**	EF_{OM}, simple, y
Build up Margin	**0.83853687**	$EF_{,BM,Y}$
Combined Margin	0.9664	EFy

The calculation for baseline emission reductions are given in **Section-E.**

Annex 4

MONITORING PLAN

The methodology requires monitoring the following

1. Net electricity generation from the new facility of the proposed project activity
2. Data needed to calculate CO_2 emissions from fuel consumption due to the project activity
3. Data needed to recalculate the operating margin emission factor, if needed, based on the choice method to determine the operating margin(OM),consistent with "consolidated baseline methodology for grid connected electricity generation from renewable sources" (ACM 0002)
4. Data needed to recalculate the build margin emission factor, if needed, consistent with "consolidated baseline methodology for grid connected electricity generation from renewable sources" (ACM 0002)
5. Data needed to calculate the emissions factor of captive power generation

GPIL have the monitoring plan with the aim that complete integrity and transparency is maintained in the following

1. Data monitoring and maintaining records of readings /printouts of readings from installed instrumentation;
2. Data collection from outside sources like CSEB; CEA etc.
3. Calculation of power generated from calculations and from comparison with actual metered readings
4 . Calculation of emissions reductions

Dedicated personnel with defined responsibilities will be made available . A third party monitoring of the data and calculations will also be carried out for maintaining accuracy.

The following data will be submitted to concerned authorities

1. Monthly report on power generation
2. Monthly report on auxiliary consumptions

Section- D gives reporting tables to be followed.

Monitoring of Steam

1. Why steam is monitored?
Steam generated by project activity is fed into a common header of existing system of CPP and steam is fed from Common Header into the new steam turbine generator (2 No.) and existing steam turbine generators (2 Nos.) to generate electricity, which is combined generation of existing system and new project activity.

2. What is the aim of monitoring of steam?
To exactly define how much steam is generated from new WHRB-2 project activity and how much of the steam is consumed in Steam turbine generator. By using this data to calculate exact electricity generated by new WHRB-2 project activity. This is essential to establish CO_2 reduction emission by the project activity.

3. Calculation of Net Power Generated from WHRB-2 New Project Activity:

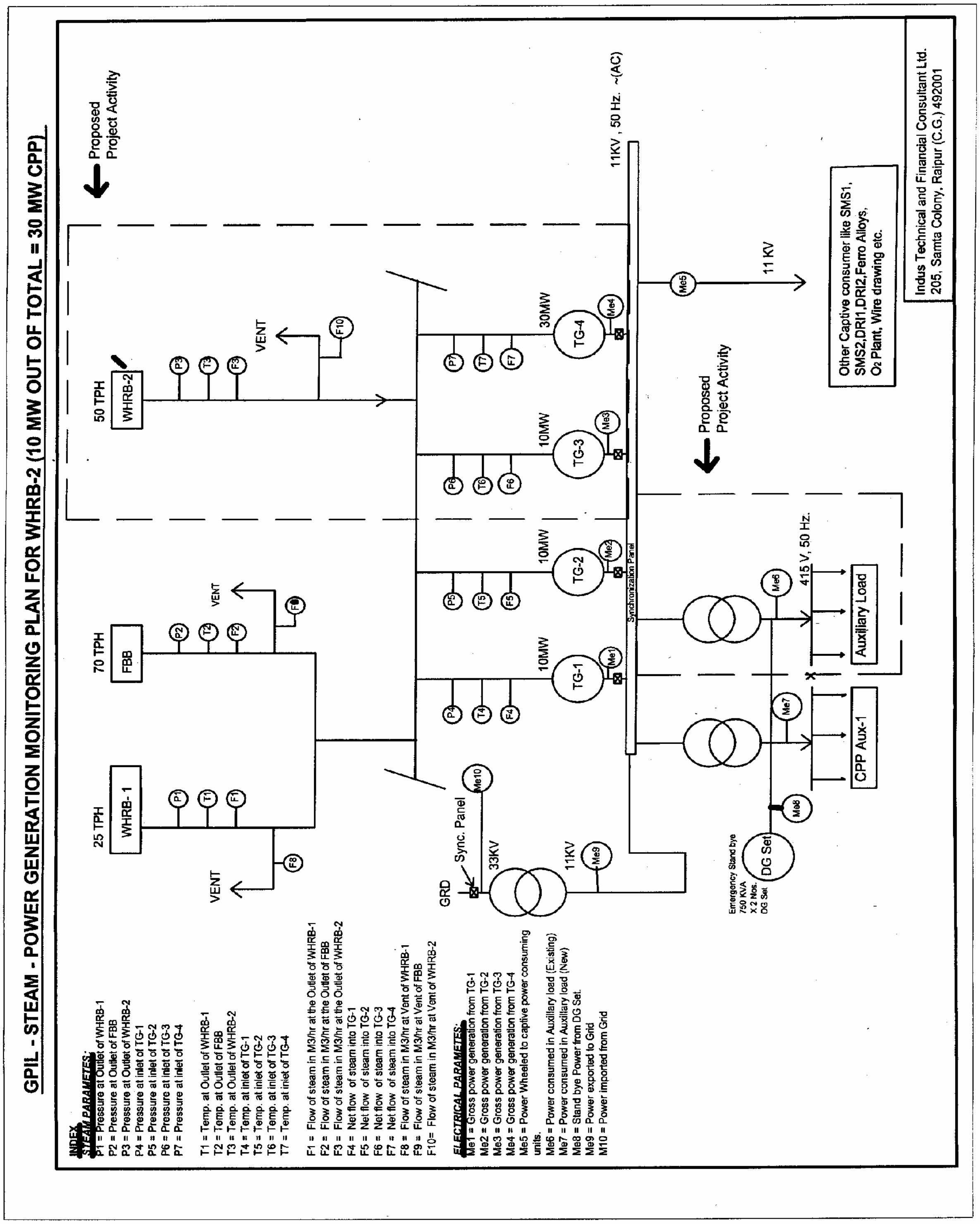
To achieve the above we follow the steps below (as per instrumentation plan given in the schematic diagram enclosed):

(A)	Calculation of Enthalpy of Steam fed from WHRB-1	=	E_1 X ($F_1 - F_8$)
(B)	Calculation of Enthalpy of Steam fed from FBB	=	E_2 X ($F_2 - F_9$)
(C)	***Calculation of Enthalpy of Steam fed from WHRB-2***	**=**	E_3 ***X*** ($F_3 - F_{10}$)
(D)	Total Enthalpy of steam Fed to the TGs generated	=	(A) + (B) + (C)
(E)	Calculation of Enthalpy of steam fed in to TG-1	=	E_4 X (F_4)
(F)	Calculation of Enthalpy of steam fed in to TG-2	=	E_5 X (F_5)
(G)	Calculation of Enthalpy of steam fed in to TG-3	=	E_6 X (F_6)
(H)	Calculation of Enthalpy of steam fed in to TG-4	=	E_7 X (F_7)
(I)	Total Enthalpy of steam fed into TG-1, TG-2, TG-3 & TG-4	=	(E) + (F) + (G) + (H)
(J)	Gross Electricity Generated (by all the TGs i.e. TG1, TG2, TG3 & TG4)	=	$Me_1 + Me_2 + Me_3 + Me_4$
(K)	Auxiliary Load / self power consumed by the Existing WHRB	=	$Me_6 + Me_7$
(L)	Net Electricity Generation by all the TGS	=	(J) – (K) (Gross Elec. Generated- Aux. Load)
(M)	Percent Contribution in Enthalpy of Steam from WHRB-2 in total enthalpy of steam used for power generation.	=	(C) X 100 / (I)

= Enthalpy of Steam from WHRB-2 X 100 / Total Enthalpy of steam fed into TG-1, TG-2, TG-3 & TG-4

(N) Contribution in Net Electricity Generation from WHRB-2 = (L) X (M)
= % Contribution of Enthalpy of Steam from WHRB-2 X Net Electricity Generated

<u>Note</u> : Steam enthalpy E in K Cal/Kg is arrived by using thermodynamic steam tables, based on the pressure and temperature readings.


GPIL - STEAM - POWER GENERATION MONITORING PLAN FOR WHRB-2 (10 MW OUT OF TOTAL = 30 MW CPP)
INDEX
STEAM PARAMETES:
P1 = Pressure at Outlet of WHRB-1
P2 = Pressure at Outlet of FBB
P3 = Pressure at Outlet of WHRB-2
P4 = Pressure at inlet of TG-1
P5 = Pressure at inlet of TG-2
P6 = Pressure at inlet of TG-3
P7 = Pressure at inlet of TG-4
T1 = Temp. at Outlet of WHRB-1
T2 = Temp. at Outlet of FBB
T3 = Temp. at Outlet of WHRB-2
T4 = Temp. at inlet of TG-1
T5 = Temp. at inlet of TG-2
T6 = Temp. at inlet of TG-3
T7 = Temp. at inlet of TG-4
F1 = Flow of steam in M3/hr at the Outlet of WHRB-1
F2 = Flow of steam in M3/hr at the Outlet of FBB
F3 = Flow of steam in M3/hr at the Outlet of WHRB-2
F4 = Net flow of steam into TG-1
F5 = Net flow of steam into TG-2
F6 = Net flow of steam into TG-3
F7 = Net flow of steam into TG-4
F8 = Flow of steam in M3/hr at Vent of WHRB-1
F9 = Flow of steam in M3/hr at Vent of FBB
F10= Flow of steam in M3/hr at Vent of WHRB-2
ELECTRICAL PARAMETES:
Me1 = Gross power generation from TG-1
Me2 = Gross power generation from TG-2
Me3 = Gross power generation from TG-3
Me4 = Gross power generation from TG-4
Me5 = Power Wheeled to captive power consuming units.
Me6 = Power consumed in Auxiliary load (Existing)
Me7 = Power consumed in Auxiliary load (New)
Me8 = Stand bye Power from DG Set.
Me9 = Power exported to Grid
M10 = Power imported from Grid
25 TPH
WHRB-1
70 TPH
FBB
50 TPH
WHRB-2
VENT
Proposed Project Activity
TG-1
TG-2
TG-3
TG-4
10MW
10MW
10MW
30MW
Synchronization Panel
11KV, 50 Hz. ~(AC)
11 KV
Other Captive consumer like SMS1, SMS2,DRI1,DRI2,Ferro Alloys, O2 Plant, Wire drawing etc.
415 V, 50 Hz.
Auxiliary Load
CPP Aux-1
GRD
Sync. Panel
33KV
11KV
DG Set
Emergency Stand bye 750 KVA X 2 Nos. DG Set
Indus Technical and Financial Consultant Ltd.
205, Samta Colony, Raipur (C.G.) 492001

Appendix I : Abbreviation

ABC	After Burning Chamber
Annex	Annexure
BAU	Business As Usual
CPP	Captive Power Plant
CER	Carbon Emission Reduction
CEA	Central Electricity Authority
CSEB	Chhattisgarh State Electricity Board
CSERC	Chhattisgarh State Electricity Regulatory Commission
CDM	Clean Development Mechanism
DM	De-Mineralized
DRI	Direct Reduced Iron
ESP	Electro Static Precipitator
EIA	Environmental Impact Assessment
FBB	Fluidized Bed Boiler
GPIL	Godawari Power And Ispat Ltd.
GHG	Green House Gas
HSD	High Speed Diesel
HT	High Tension
IBR	Indian Boiler Regulation
KWh	Kilo Watt hour
Kg/cm^2	Kilogram per centimeter square.
LSHS	Low Sulphur Heavy Stock
MWh	Mega Watt hour
MW	MW
MU	Million Units.
NM^3/Hr	Normal Meter Cub per Hour
PLF	Plant Load Factor
PDD	Project Design Document
Qty	Quantity
SEB	State Electricity Board
STG	Steam Turbine Generator
SPM	Suspended Particulate Matter
tCO_2	Tonnes Carbon-dioxide
tCO_2eq	Tonnes Carbon-dioxide equivalent
TPD	Tonnes Per Day
T/hr	Tonnes per hour
T&D	Transmission and Distribution
TG	Turbine Generator/ Turbo Generation.
WHR	Waste Heat Recovery
WHRB	Waste Heat Recovery Boiler
WREB	Western Regional Electricity Board