CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

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Title of project activity : WHR CDM CPP

CDM document version No : 01

Date of Document : 20-02-2007

A.2. Description of the project activity:

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I. Purpose of project activity

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 steam produced from the new project activity will generate about twenty five MW electricity. This is an independent activity in addition to the already established and operating captive power plants (having 7 MW WHRB1, 10 MW WHRB2 and 11 MW Coal based 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 to Chhattisgarh State Electricity Board (CSEB) transmission and distribution (T & D) Grid.

Proposed project activity is to generate electricity by generating steam using waste heat contained in the flue gases released from two no's of Ore-heating kilns of Sponge Iron Kiln.

Waste gases coming out of the Ore-heating kilns will be transferred to water which converts water in to steam in Waste Heat Recovery Boilers. The steam produced from two WHRBs will be fed into the turbo-generator through a common header to generate electrical energy. The estimated power generation capacity will be 25 MW.

GPIL is installing two new waste heat recovery boilers, after each Ore-heating Kiln of the two new 500 TPD sponge iron Kilns. The two WHRBs will be able to recover up to about 75% of the waste heat energy remaining in the flue gas to produce medium pressure steam. The steam will be further utilised to generate electrical energy; through one 25 MW Steam Turbine being installed with the new project activity.

The net result is reduction in the demand of electricity from coal based captive power plant and resultant reduction in GHG emission.

Source of waste heat: The Company is the first company in India, which is replacing conventional ABC with Ore-heating kiln to utilise part of the waste heat to heat the iron ore before feeding it into the reduction kiln. The hot waste gases coming out of the reduction rotary kiln will pass through the Ore-heating kilns where in heat contained in waste gases will be

partially transferred on the iron ore fed into the Ore-heating kilns. Due to this iron ore heating, substantial saving will be achieved in per tonne coal consumption to produce sponge iron at the same time the flue gas temperature coming out of the sponge iron process is likely to be lower than exhausted from conventional ABC. The company is implementing this project also as a separate CDM project, for which a new methodology and the PDD is being submitted separately by the company.

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 has already established two Sponge Iron production Rotary Kiln with 350 tonnes / day and 500 tonnes /day capacity using Coal as fuel. Based on the CDM Strength the company has established two WHRB power plant first with7 MW in the year 2002 and second with 10 MW in the year 2006. The company had simultaneously established one 11 MW FBB power plant based on Coal / Char/ Dolochar in the year 2003 . According to the planned capacity expansion, the Company is installing two more 500 TPD Sponge Iron Plants along with two numbers of Ore-heating kilns also as a CDM project activity; to preheat the iron ore. With the new developed Ore-heating kilns it will be possible to partially utilise the waste heat contained in the flue gases to reduce the overall energy consumption in the sponge iron production process, which will substantially reduce the GHG emission from sponge iron making process. Along with these new facilities based on CDM strength, 25 MW Waste Heat Recovery Boilers based CPP is being set up. All these facility are being set up independently at the adjoining land area of the existing plant.

The added 25MW WHRB capacity is treated as a new facility as per approved methodology and is referred to in this PDD as "WHR CDM CPP".

The total CO_2 emission reduction during the entire crediting period of 10 years have been calculated as 152787.790 tonnes 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 as well as economic growth .

Facility Available and New Facility being created:

GPIL have received the registration from CDM-EB for the existing WHRB-1 based 7 MW power generations as CDM project activity for 350 TPD sponge iron rotary kiln. The second CDM project of the company having 10 MW WHRB-2 power generations is also registered. The existing CPP comprises of one 7 MW WHRB, another 10 MW WHRB and one 11 MW Coal Based FBB Boiler.

25 MW WHR CDM CPP is being installed along with two Ore-heating kilns of two new 500 TPD sponge iron rotary kilns; as a part of planned capacity expansion of sponge iron manufacturing capacity from 850 TPD to 1850 TPD. Therefore as per methodology "WHR CDM CPP" is to be treated as new facility.

GPIL already has and will have independent, transparent and proper monitoring system to calculate the actual power generated by measuring actual steam generation by "WHR CDM

CPP" & power generated due to it. 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 partially utilised waste heat energy of Flue 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.
- Generate socio economic benefits to the community
- Achieve technological excellence
- Promotes the sustainable development.

Sustainable Development
The project activity will lead to sustainable development and promote sustainable Industrial growth by promoting technological excellence, conserving natural resources and preventing the thermal pollution even though no such statutory requirement exists.

Social benefit to State: The project activity contributes in reducing the CSEB grid deficit by not making demand for electricity, which would have been the case if the new 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 and outside the company for skilled manpower and professionals as well as for semi skilled & unskilled manpower also.

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 waste heat recovery CPP in GPIL will displace /replace the coal based FBB Captive power generation; thus Project activity saves further depletion of natural Coal reserves, thus there is no generation of any solid waste like fly ash which would otherwise been generated. The disposal of fly ash has been a serious environment concern. Thus the Environment is also benefited by reduced solid waste problem, reduces CO_2 emission which would have been otherwise emitted from coal based captive power plant. The proposed ESP shall remove the ash from Flue Gases thus reducing ambient SPM level, 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. 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.

Technological Benefit: The Project activity uses Waste heat from flue gases coming out of Ore-heating kiln. Wherein the heat of flue gas is first transferred on the iron ore and the remaining heat is transferred on water to generate steam for power generation.

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 without any T&D losses.

Reduction in Water consumption & Waste Water Generation: 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, spraying on sponge iron cooler and green belt development etc.

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)
Govt of India (host)	Godawari Power And Ispat Ltd.- Private entity	No

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 State

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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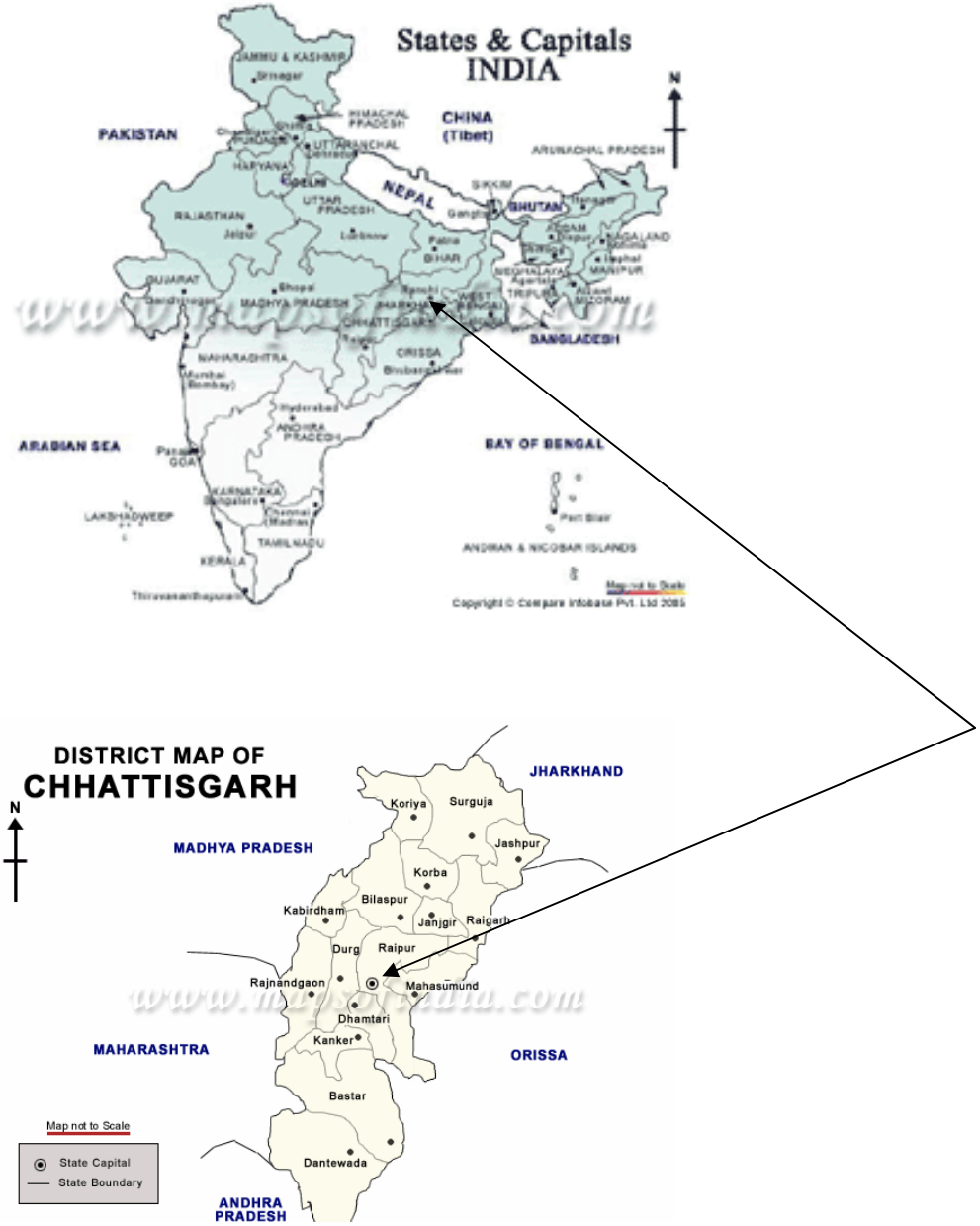
Physical Location:

Adjoining to 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.



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

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The project activity is an electric power generation project activity, based on waste heat recovery based steam generation by utilising waste heat from waste flue gases, where aggregate gross electricity generation savings exceeds the equivalent 138600 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" on the website http://cdm.unfccc.int/DOE/scopes 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 shall utilise the heat content of approximately 250000 Nm^3/h of Flue gases at an estimated temperature of 950^0 C coming out of Ore-heating kiln of Sponge Iron kiln.

The Exhausted flue gases from Rotary kiln are received at Ore-heating kiln for further incineration where the waste gas temperature reaches up to 900^0C to 1000^0C. part of the Waste heat contained in the flue gases is transferred on the Iron ore fed into the Ore-heating kiln, for the purpose of pre heating. No auxiliary fuel is fired in Ore-heating kiln. The temperature of exhaust flue gas is likely to drop up-to 850 to 900 degree Celsius whereas the temperature of fed iron ore is likely to go up to 800 degree Celsius. The preheated iron ore then enters the main reduction rotary kiln. This will therefore save lot of energy in sponge iron production which will reduce consumption of coal in sponge iron making process. A separate PDD and a new methodology is being submitted for this project of energy efficiency in sponge iron making due to Ore-heating of ore from flue gas waste heat due to which the coal consumption and carbon emission is reduced in sponge iron production. In view of the reduced temperature likely to emit from the Ore-heating kilns of sponge iron kiln, the design of boilers require reengineering to suit to the changed thermal profile of waste gases.

This waste heat shall produce 51 tonnes of steam from each boiler at 105 bar, 525 digree$\pm 5^0$C, thus total 102 tonnes/hr of steam at 105 kg/ cm^2 pressure at 525 ± 5^0C Temperature from both the boilers. The boilers will be of 3 flue gas passes, consisting 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 in 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 25 MW high efficiency extraction cum condensing multi stage Steam Turbine and Generator (STG) shall be operated to generate 25 MW Electricity. At 100% MCR the best steam consumption under inlet parameter of 100 bar A and 520 ^{0}C and with steam exhaust pressure 0.176 bar A will be achieved. For the sake of conservative estimates we have considered 3750 kg steam consumption per MWh Power generation. The 25 MW TG set being installed along with the WHRB 3 & 4 is installed separately, totally independently in addition to the four existing ones.

In the existing facility, GPIL already operates 3 STG's each of 10 MW capacity and one 30 MW STG, feeding steam from existing WHRB1, WHRB2 and FBB.

Ash collected from 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 25 MW power generated shall be used first to meet the captive power requirement of the company and in case of surplus will be wheeled to the Grid.

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

The project activity will be working 330 days in a year. No supplementary fuel is used in WHRB. Hence during the shut down of rotary kiln CPP will also not function.

The project activity was started as per board's resolution with equipment selection and ordering process on 29 October 2004. The Captive Power Plant is likely to be commissioned in 1st March 2007 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 Estimated amount of emission reductions over the chosen crediting period:

>> Chosen credit period = 10 years.

Years	Annual estimation of emission reductions in tonnes of CO_2equi
2007-2008	152787.79
2008-2009	152787.79
2009-2010	152787.79
2010-2011	152787.79
2011-2012	152787.79
2012-2013	152787.79
2013-2014	152787.79
2014-2015	152787.79
2015-2016	152787.79
2016-2017	152787.79
Total estimated reduction	152877.90
Total numbers of crediting years	10
Annual average over the crediting period of estimated reduction (tonnes CO_2 equi.)	152787.79

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 and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring 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, 03 March 2006.

B.2 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 Ore-heating kilns of third & fourth sponge Iron kiln through two new WHRB, producing steam. The steam will be utilised for 25 MW power generations.
2. The Power will be first used in house, only surplus will be wheeled to the Grid.
3. In the absence of the Project activity, the company would have generated equivalent of 25 MW power by increasing the power generating capacity of coal based captive power plant. Hence the power plant displaces generation of fossil fuels based captive power.
4. There will be no fuel switch in sponge iron manufacturing process after the implementation of the Project activity.
5. There will be no fuel switch in WHRB
6. The project activity is carried out as a part of planned increase in capacity of sponge iron production from 850 TPD to 1850 TPD by adding the third & fourth Sponge Iron Kiln. Hence the project activity is treated as new facility for the added 1000 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 IPCC and 25 MW turbine specification of manufacturer as it is more efficient in generation of electricity per tonne of steam. Coal based FBB captive power plant efficiency is conservatively calculated after considering boiler efficiency as 100% in line with Option- B of methodology.
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 25 MW power Units by displacing coal based captive power generation with an emission reduction of 152787.79 tCO_2e/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.3. Description of the sources and gases included in the project boundary

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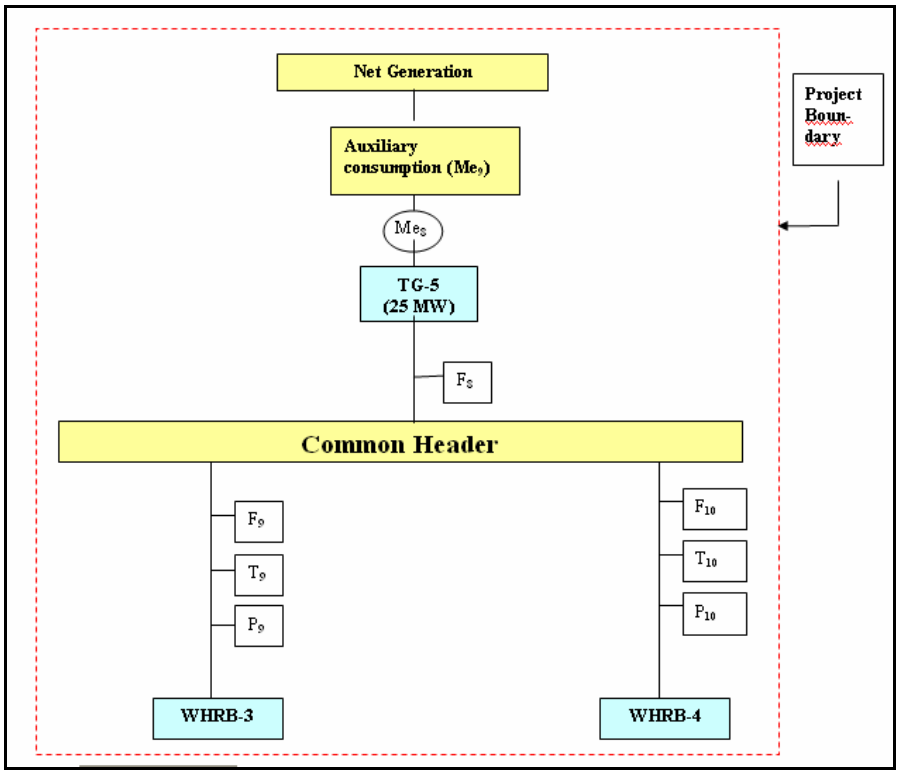
In line with methodology, the project activity is for the recovery of Waste Heat from Flue Gases for generation of steam for the electricity to be generated from CPP. .

The baseline scenario "The electricity would have other wise been generated by installing a new coal based boiler or by increasing the capacity of existing coal based captive power plant . Hence the project activity displaces the Electricity generated from Steam produced from fossil fuels. There is no fuel switch in rotary kiln where the hot waste gas is produced after the implementation of project activity"

In line with methodology the project boundary comprises of the Ore-heating Kiln exhaust duct (Source of waste hot gases), Waste heat recovery boiler, steam flow piping, flue gas ducts, Power Generating Equipments, & Auxiliary Equipments where project participant has full Control.



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

	Source	***Gas***		***Justification / Explanation***
Baseline	*Captive 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.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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

1. Project activity displaces the electricity generation by coal burning in a Coal based captive power plant.
2. Project activity is based on waste heat utilisation to generate 25MW electricity. This will be used 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 Ore-heating Kiln 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 25 MW could be met by installing a new coal based boiler or by increasing the capacity of existing 11 MW coal based captive power plant capable to use coal and char / dolochar, (the abundantly available fuel).
6. There is no legal binding that the waste heat is to be recovered.
7. The Project activity is being implemented to reduce the Coal based captive Power generation.
8. Project activity effectively uses the waste heat to generate 25 MW Power which would have otherwise been generated in the coal based captive power plant by combustion of fossil fuels.
9. GPIL is implementing the Ore-heating technology to preheat the iron ore before feeding into the reduction kilns, by partially utilizing the heat contents in flue gas. The remaining heat will be used to generate steam in WHRBs. 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.

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 baseline scenario "The electricity would have other wise been generated by installing a new coal based boiler or by increasing the capacity of existing coal based captive power plant. Hence the project activity displaces the captive power generation from fossil fuels. There is no fuel switch in rotary kiln where the hot waste gas is produced after the implementation of project activity"

Hence by adding the WHRB based CPP of 25 MW, the project activity displaces the CO2 emissions by reducing the additional demand on existing coal based captive power plant.

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 generate 25 MW power.
2. The Power will be used in house.
3. In the absence of the Project activity, the Company would have generated equivalent of 25 MW power by installing a new coal based boiler or by increasing the capacity of existing 11MW Coal based captive power plant. Hence the power plant displaces 25 MW captive coal power.
4. There will be no fuel switch in sponge iron manufacturing process after the implementation of the Project activity.
5 The project activity is carried out as a part of planned increase in capacity of sponge iron production from 850 TPD to 1850 TPD by adding the third & fourth Sponge Iron Kiln. Hence the project activity is treated as new facility for the added 1000 TPD Sponge Iron production capacity related to Waste Heat Recovery Boiler based 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 25 MW power without adding any GHG emissions.

The absence of Project activity requires the production of additional 25 MW power by the Coal based captive power plant, which result in emissions of 152787.79 tCO_2 equi./ annum. Ref: B.4 for supporting calculations.

B.5. 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 (assessment and demonstration of additionality): >>

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. Ore-heating Kiln 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 generating required additional power by installing a new coal based boiler or by increasing the capacity of existing 11 MW coal based captive power plant. Hence the project activity achieves reduction in CO_2 emission by displacing the coal based power by WHRB based captive power which does not generate any CO_2 .

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 22nd 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-generation of power from Coal based Captive power plant 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 adversely impact the implementation of the project activity.

The base line methodology outlines five steps to demonstrate additionality.

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

a.	Provide evidence of the starting date of CDM project activity	The WHRB order dated 29 October 2004 is considered as starting date of the new project activity. The company recognises that CDM crediting period shall commence after registration. The company had put up it's first WHRB power of 7 MW based on the CDM strength only which is already registered.
b.	Provide evidence that incentive from the CDM was seriously considered in the decision to proceed with the project activity.	GPIL, had already put up 7 MW & 10 MW two WHRB CPP based on CDM strength as per the board resolution regarding CDM benefit. The copy of the order and extracts of the board meeting will be made available to DOE. *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 third project activity of 25 MW WHRB based CPP.* 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 18 -11- 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 the alternatives to the project activity considered with current law and regulations

Step 1.a

	Identify realistic and credible alternatives available. (a)The proposed activity not undertaken as CDM project activity. (b) All other plausible and credible alternatives (c) Continuation of current situation	In section B.4 all the possible alternatives have been discussed for the alternatives recognised were: 1) Project activity not as CDM activity. 2) Import from Grid. 3) Alternative fuel HSD. 4) Alternative fuel Gas. 5) Alternative fuel Coal +Char/ Dolochar + Washery reject. 6) Combination of grid and coal power. 7) Alternative of Waste heat. 8) Continuation of current situation. GPIL has concluded that use of coal as fuel for captive power generation is the most attractive option economically, hence as per ACM 0004/Version 02 Sectoral Scope :01,03 March 2006 this is considered as base line.

Step 1.b Enforcement of applicable laws and regulations:

1	Alternative shall be in compliance with legal and regularly requirements.	All the alternatives are in compliance with current legal and regulatory requirements.

GPIL select Step 3 Barrier Analysis

STEP-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.*

3.a.1	**Investment barriers**	

	Debt funding is not available for this type of innovative project activity.	When GPIL approached for finance of stand alone WHRB project activity, the financial consultants advised that: 1) WHRB captive project does not fall under essential financial services (i.e. priority sector lending). 2) As WHRB stand alone project is not economically feasible, Hence the finance can not be made available. 3) It was advised by the financial consultants that company should go for increasing the coal based captive power generation as the same is most economically attractive The financial consultant's advice letter will be made available to DOE.
3.a.b	**Technological barrier**	
	A. Risks of technology due to change in the waste heat path after the main kiln from ABC to Ore-heating kiln.	The proposed Waste heat recovery boiler being installed after the Ore-heating kiln is being attempted for the first time in India. It has got its own associated technological risks.
	B. Skilled and or properly trained manpower is not available	1) As per Joint Plant Committee report "Survey of Sponge Iron Industry 2005-06". 1. 77 units out of 147 coal based unit are going in for expansion in capacity. 2. Jharkhand, Chhattisgarh and Orissa are states where majority of expansion activities will be installed. 3. Constraints faced by sponge iron industry are: a) Raw Material b) Power c) Finance d) Labour As so many units are expanding in the area, the availability of skilled technical personnel is a problem. Company has to hire the untrained personnel and impart the training.
	C. Lack of infrastructure for implementation of the technology	2) Company has to procure all the necessary equipment required for creating the require grid support infrastructure for proper implementation of the project.

		Extra infrastructure was also required due to the requirement of laying 132 KV line to synchronise with back up power & to remain connected to CSEB grid .
	D. Lack of well established design of WHRB based on 500 TPD sponge iron kiln	3) WHRB design for 500 TPD kiln was not established when the same was ordered for its second kiln. The company selected one of the best boiler manufacturer in the country to supply WHRB. However, when commissioning activities of the 10 mw WHRB were started in September 2005, design related technical problems were encountered. The boiler manufacturer took 3 months to decide the nature of problem and then after discussions with his collaborator, the down comer design modification was carried out. Due to this the 10 MW WHRB and second 500 TPD Sponge Iron manufacturing was shut down which in turn resulted in production & financial losses from September 2005 to December 2005. Only on 1 -1- 2006, commercial production was started, and again the tubes in the boiler got damaged and the company had to take shut down for repair of the tubes in August 2006. All these barriers delayed the planned implementation of the IIIrd & IV kilns also
	E. Inconsistency of operation due to the various factors beyond the control of the project proponents	The Sponge Iron Rotary Kiln operation is dependant on many factors such as Iron ore quality, Coal quality etc., the flue gas temperature and quantity variations result in lowered steam generation and hence power generation. Due to the variations observed, the PLF of WHRB is low. In place of ABC the company is

		installing Ore-heating kilns for the first time in India to preheat the iron ore this may result in drop of flue gas temperature. This may affect the waste heat recovery and boiler performance thereby affecting the steam parameters.
	F. Frequent process disturbances beyond the control of the project proponents.	4) The Sponge Iron Kiln has to take shut down every 3-4 months due to the ring formation or the other requirement of the manufacturing process. This results in 40-43 days shut down in a year and this results in WHRB shut down also and hence the power generation loss.
	G. Inconsistency in power generation from WHRB requiring backup grid power	5) Due to the inconsistency of WHRB power generation, the company has to seek additional 4.5 MVA back up power. This require to install 132 KV infrastructure. The cost towards this is substantial to carry out the installation of 132 KV synchronisation equipments. Additionally company has to installed a transformer of 132/33 KV & other Extra High Tension equipment. The above results in extra maintenance requirement of high voltage lines.
		6) If the temperature of flue gas exceeds 900^0C , then the boiler trips as the higher temperatures are damaging to the boiler tubes and the flue gas are exhausted through the emergency cap. As limited manual provision to control the exit temperatures of kiln is there, this acts as technical barriers. 7) The inlet temperature to ESP has to be maintained at near about 150^0C to 190^0C, as the higher temperature of flue gas will damage ESP. Even lower temperatures may cause acid condensation which may lead to corrosion of the flue path ESP

		components & stack etc. Hence the boiler has to work as per its design parameters as any disturbance in performance of boiler due to any reasons affects the ESP and also power generation. This acts as a technological barrier. 8) The shutdown of WHRB may result in shutdown of Induction furnace, Ferro alloys plant etc. which result in to production losses, quality disturbance, financial losses etc.
	Barriers due to prevailing practice.	
	Discuss the project activity in host country.	As per the prevailing practice most of the sponge iron plants have installed ABC wherein the flue gas is flared with air and temperature is regulated below 1000 degree Celsius by water quenching, then flue gas are passed to WHRB for power generation. This is the first project in India to set up a Ore-heating Kiln in place of ABC. Joint Plant Committee report as " Survey of Indian Sponge Iron Industry 2005-06" lists the following: 1) Out of 147 Sponge Iron Industry surveyed only 16 units have captive power generation, 8 units out of 16 units are in Chhattisgarh state. Chhattisgarh has 38 Sponge Iron Units of 147 units surveyed. 2) Out of 8 units 6 units have applied for CDM registration as they had put the project considering CDM benefit basis. 3) Only 3 units namely, Jindal steel & Power, Prakash Industries and HEG Ltd have put up their captive power plant before CDM activity started. 4) As CDM activity can not be treated as common practice, only 3 captive power generation units out of 58 sponge iron units constitute less than 5% units putting CPP based on WHRB. 5) As the captive power generation

		based on WHRB is not sufficiently diffused in the region, hence WHRB based captive power project is not prevailing practice. JPC Report can be made available and information on 6 units going in for CDM benefit can be checked from UNFCC website. 6) Over and above all the factors stated above, the company is the first company to install a WHRB with a Ore-heating kiln exhaust flue gases.
	Regulatory Barriers	1) The wheeling agreement with CSEB is one sided with GPIL, required to take all responsibilities for costs and technical issues. 2) Due to the new project activity GPIL have to provide 132 KV lines/ transformers to remain linked to CSEB which resulted in additional cost. 3) The demand charges payable even if CSEB is not in position to supply power as a result of power shortage and resulting power cuts. Reference can be made to CSERC order against Petition 17 of 2006 (m) in this regard. 4) Low payment made for infringe power supplied to the grid by CSEB. The CSEB does not pay any attractive price for the infringe power. 5) The company has to seek additional 4.5 MVA backup power from CSEB at 132 KV which cost about 50 million Rs additional. It also requires enormous formalities to be completed. The company has to bear all the risks and cost.

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 and CSEB would be having no objections to continue to supply the additional demand of power as already and presently the required back up power is being provided by CSEB. But the grid power is costlier than coal based captive power. As well as, the grid has the power crisis, resulting into frequent power cuts.

2) CPP based on HSD/Gas (Alternatives 3. and 4)
None of the above are a barrier in this alternative. However CPP based on HSD/Gas will have additional GHG emissions from the plant.

3) Alternative 5 CPP based on Coal
None of the above barriers act as barriers in this alternative. This option is economically most attractive as increasing the existing capacity of coal based 11 MW FBB can be achieved with minimum cost

4) Alternative use of waste heat contained in flue gases emitting out of the Ore-heating kiln (Alternative 7) 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.

5) Continuation of the current situation (Alternative 8), as shown above the continuation of current situation is GPIL generates 11 MW coal based captive power (as shown in alternative 5), along with CDM based 7 MW & 10 MW WHRB1 &2 power and additionally draws 8.5 MVA back up power from grid to meet deficient power requirement caused due to fluctuating power generation from WHRB. Grid power is not dependable as grid is facing shortage of power and is resorting to power cuts which affect production. WHRB power is facing technical & financial barriers thus not feasible. Out of the above three sources of power at current situation the continuation only with the expansion in coal based captive power generation is feasible, as considered in option 5. Thus the continuation of current situation as a whole is not plausible.

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.

1.	Provide an analysis of any other activities implemented	As per JPC report as " Survey of Indian Sponge Iron Industry 2005-06" only 16 units our of 147 sponge iron units have captive power generation and out of these 8 units are from Chhattisgarh State. As per details available, 4 more units have gone in for captive power generation based on WHRB. However based on UNFCCC web reference, we can

		find that 10 units have opted for CDM project benefits. This shows that only three units have put the captive power project and these are Jindal Steel & Power, Prakash Industries and HEG Ltd who have put up their project before CDM activity started. This indicate that only 3 units out of 58 units have gone in for captive power generation without CDM strength and this constitutes less than 5% diffusion.
2	Activities in similar scale.	The project activity is for 500 TPD X 2 number Sponge Iron kilns capacity with Ore-heating kilns. As WHRB design is not well established for 500 TPD, thus except one company no other company with 500 TPD kiln have gone in for WHRB captive power generation. This company also has applied for the CDM benefit. The GPIL was only the second company to implement WHRB power with 500 tpd kiln with which it had established a 10 MW WHRB. Whereas in the present 500 tpd kiln in place of ABC Ore-heating kilns are being set up which is likely to reduce the flue gas temperature entering into WHRB. This will be the first such project in India.

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

1.	Discussion of similar activities	The present project activity is WHRB based captive power plant for two numbers of 500 TPD each Sponge Iron Kiln having pre heating kilns in place of ABC. Due to the difficulties faced technologically as 500 TPD WHRB design being not well established and due to the investment and technological barriers only one other 500 TPD installation having ABC had gone for similar activity with CDM strength. There is no similar 500 tpd kiln with Ore-heating kiln.

JOINT PLANT COMMITTEE REPORT ON "SURVEY OF INDIAN SPONGE IRON INDUSTRY 2005-06"

Under the aegis of the Ministry of steel joint plant committee (JPC) was constituted by government of India. is the sole custodian of authentic database on the Indian iron and steel industry. The following are major findings:

Report in the "Survey of Indian Sponge Iron Industry 2005-06" has the following statement on Page-3 of 11.

"growth of domestic steel demand, vigorous growth in domestic steel production in secondary steel making sector, techno economic like relative low cost of investment, ease of setting of sponge iron plant, clear cut technology of direct reduction, better quality in end product, availability of mineral resources, abundant labour as well as professional/ technical expertise, frequent problem of scrap, all operating in the facilitating backdrop provided by a free market economy have boosted the growth of the industry"

Indian sponge iron industry summarised table given in JPC report

Table 1	**Indian Sponge Iron Industry : Both Coal & Gas Segments**					
	Data Collected		**Additional / Industry/ Field sources^**		**Total**	
	No of Units	**Capacity (Unit :mt)**	**No. of units**	**Capacity # (unit:mt)**	**No. of units**	**Capacity (unit:mt)**
Operating						
Coal	147	11	56	2	203	13
Gas	3	6	-	-	3	6
Total	150	17	56	2	206	19
Under commissioning (Coal)	58	6	167	12*	225	18
Brownfield Expansion : 77 out of 147 working coal based unit	-	7	-	-	-	7
^=State DI Offices; #=Estimated, *=included units in proposal/ planning stage						

Raw materials:

JPC survey list the following the main constraints faced by sponge iron industry, on Page 7 of 11.

"Analysis of the data shows that out of 147 units surveyed, raw material (availability and prices), accounts for the largest (96%) amongst the nature of constrains faced by a coal based sponge iron unit today, followed by power (cost), and to lesser extent finance (availability), and labour negligible".

JPC survey on page 5 & 6 of 11 :

"**Coal Linkage**: Analysis of the data shows that out of the 147 units surveyed, 60% has their own coal linkage. The state wise picture shows Orissa and Chhattisgarh tops the list with West Bengal close behind. But the scenario in the other states is not much encouraging, indicating the Indian coal based sponge iron producers are dependent on market sources for procuring this key raw material.

Iron Ore: Analysis of thee data shows that out of 147 units surveyed, iron ore from mines, be it captive (virtually nil) or leased (minimal), plays an insignificant part in meeting iron ore requirements of the domestic coal based sponge iron segment. In other words, this indicates that in case of iron ore also, Indian coal based sponge iron producers are dependent on market sources"

Captive power generation

On page-7 of 11 of JPC report under the heading "captive generation facility"

"Analysis of the data shows that out the 147 units surveyed, the number of units with captive power generation facility is quite low; total of such units being only 16, with maximum concentration occurring in Chhattisgarh (8 units)"

Expansion

"77 out of 147 coal based units are going in for expansion of existing capacity."
Jharakhand, Chhatisgarh and Orissa are states where majority of this fresh capacity will be installed

JPC report is enclosed as part of proof for the following barriers

1. Investment barrier due to shortage of iron ore and coal and market variation
2. Common practice analysis/prevailing practice.
3. Technogical barrier due to shortage of technical manpower due to heavy expansion in sponge iron industry

CSEB GRID POWER SITUATION

The following is brief write up on Petition 17 of 2006(m) and Order by Chhattisgarh State Electricity Regulatory Commission

Chhatisgarh Mini Steel Plant Association - Petitioner

Chhatisgarh State Electricity Board - Respondent

The petition was filed by association as;

1. CSEB was not maintaining regular distribution of supply and practiced unscheduled power cuts resulting in losses

2. Association sought regular supply and relief in demand charges which are levied by CSEB even when CSEB can not supply power

Even though regulatory commission in their order did not grant relief in demand charges , but accepted the serious power shortage with CSEB grid and directed the CSEB to take necessary steps for load management .

1. To keep unscheduled power cuts minimum
2. Load shedding should be planned and CSEB should take consumers in confidence.

CSEB has to take recourse to power shutdowns as the availability of power is less than demand.

This order is enclosed to prove the following barriers

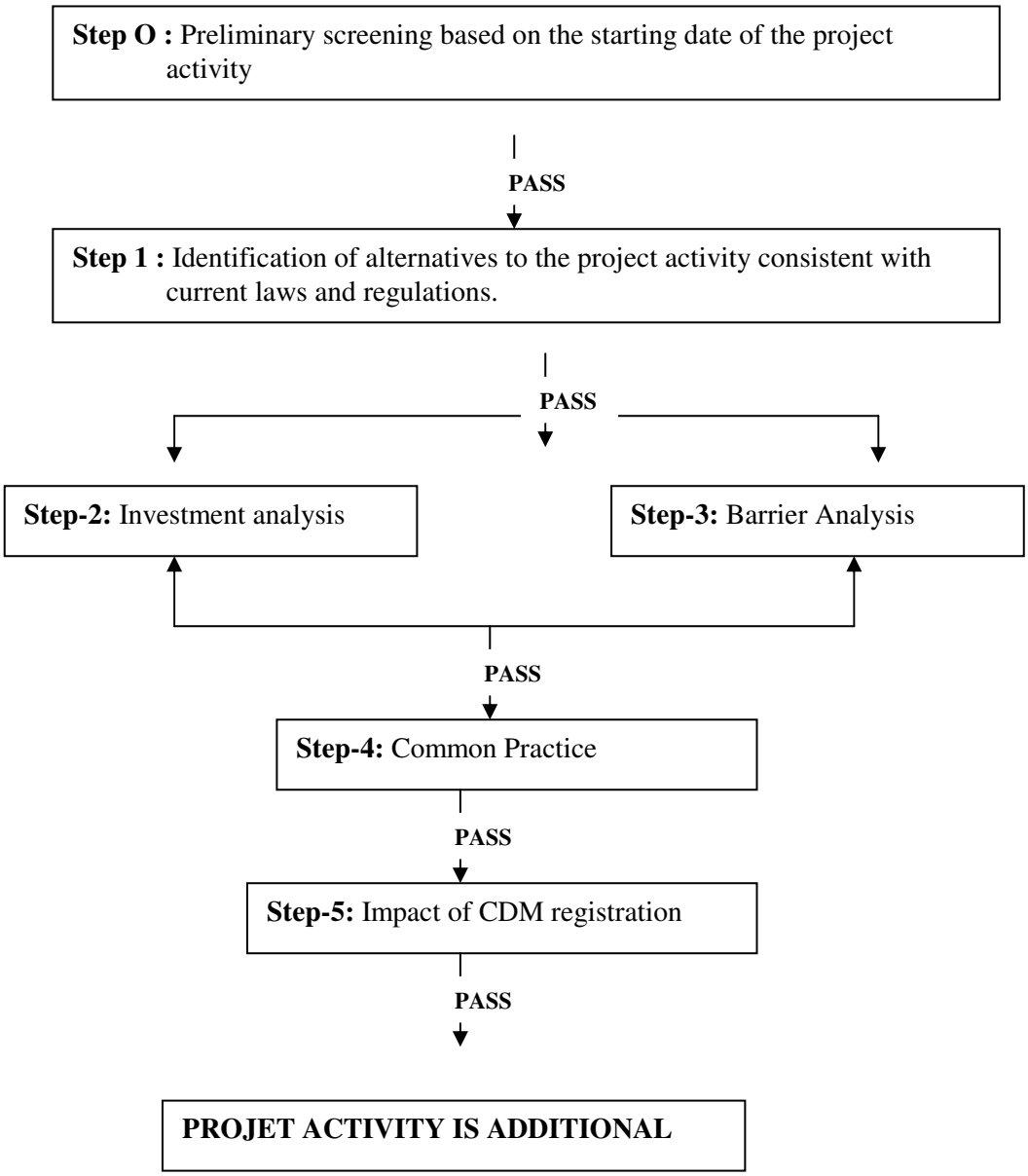
1. Power shortage and power cuts which result in losses. Companies can not depend on grid power

2. Financial burden of demand charges even when power is not available as CSEB is monopoly grid

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 remunerative direct sales of power to outside party is involved & where a financially more viable route to generate coal based captive power is sacrificed.
2) The possible income generated through sale of CERS will help in achieving sustainable Power generation. With the CDM support the industry in future can plan to procure better quality inputs at much higher cost which can help in improving the productivity of the industry as well as performance of the Project Activity also. This may further help to improve the lower capacity utilisation to a better capacity utilisation. This will also indirectly help in further energy conservation and more sustainable development. In net effect the overall sustainable gains may also improve.
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 CER's will be received in international currency.

Flow Chart : Additionality Scheme



B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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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 Ore-heating kilns of GPIL'S IIIrd & IVth Sponge Iron Kiln through two new WHRBs by producing steam. The steam will be utilised for 25 MW power generations.
2. The Power will be first used in house, only surplus will be wheeled to the Grid.
3. In the absence of the Project activity, the Company would have generated equivalent of 25 MW power by increasing the power generating capacity of coal based captive power plant. Hence the power plant displaces generation of fossil fuels based captive power.
4. There will be no fuel switch in sponge iron manufacturing process after the implementation of the Project activity.
5. There will be no fuel switch in WHRB
6. The project activity is carried out as a part of planned increase in capacity of sponge iron production from 850 TPD to 1850 TPD by adding the IIIrd & IVth Sponge Iron Kilns with Ore-heating kilns in place of ABC. Hence the project activity is treated as new facility for the two numbers of added 500 TPD each capacity Sponge Iron plant 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 IPCC and 25 MW turbine specification of manufacturer as it is more efficient in generation of electricity per tonne of steam. Coal based FBB captive power plant efficiency is conservatively calculated after considering boiler efficiency as 100% in line with Option- B of methodology.
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 25 MW power Units by displacing coal based captive power generation with an emission reduction of 152787.79 tCO_2e/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.6.2. Data and parameters that are available at validation:

(Copy this table for each data and parameter)

Data / Parameter:	EGGEN / Electricity
Data unit:	MWh
Description:	Gross
Source of data used:	Electronic meter
Value applied:	100%
Justification of the choice of data or description of measurement methods and procedures actually applied :	The electronic meter provided at the output of turbine generator. The meter reading will be available on DCS continuously and same will be transferred to log book to be maintained by shift engineer , approved by shift in charge as the daily report There is a second meter sealed by CSEB as company has to pay cess on any power generated in CPP. The CSEB meter is calibrated by government department and will be considered as final in case of discrepancies in the readings of two meters.
Any comment:	Nil

Data / Parameter:	EG AUX / Electricity
Data unit:	MWh
Description:	Gross
Source of data used:	Electronic meter/ calculated
Value applied:	100%
Justification of the choice of data or description of measurement methods and procedures actually applied :	The electronic meters provided at the supply point to each auxiliary consumption points. The meters readings will be available on DCS continuously and same will be summed up by DCS to arrive total auxiliary consumption. This data is transferred to log book to be maintained by shift engineer, approved by shift in charge as the daily report.
Any comment:	Nil

Data / Parameter:	EG y / Electricity
Data unit:	MWh
Description:	Gross
Source of data used:	Calculated
Value applied:	100%
Justification of the choice of data or description of measurement methods and procedures actually applied :	EG y=EGGEN - EGAUX
Any comment:	Nil

B.6.3 Ex-ante calculation of emission reductions:

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Emission Reductions

Project activity mainly reduces CO_2 through substitution of coal based captive electricity generation.

The emission reduction ER_y by the project activity during a given year y is the difference between the basline emissions through substitution of electricity generation with fossil fules (BE_y) and project emissions (PE_y), as follows:

ER y = BE y – PE y

Where,

ER y = are the emission reduction of the project activity during the year y in tons of CO_2.

BE y = are the baseline emissions due to displacement of electricity during the year y in tons of CO_2,

PE y = are the project emission during the year y in tons of CO_2

No project emission is considered and no leakage is considered

Where the baseline emissions

BE y in tCO2 = $EF_{captive}$, y X EG y

EG y = E_{GEN} – E_{AUX} = Net electricity supplied by project activity

No project emission and no leakage is considered inline with methodology

B.6.4 Summary of the ex-ante estimation of emission reductions:

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Emission factor is Ex-ante based and will remain fixed for the entire crediting period

Calculation of emission in baseline

Year	Net Elec. Generated (EGy)	baseline emission(BEy)
1st	124740.00	152787.79
2nd	124740.00	152787.79
3rd	124740.00	152787.79
4th	124740.00	152787.79
5th	124740.00	152787.79
6th	124740.00	152787.79
7th	124740.00	152787.79
8th	124740.00	152787.79
9th	124740.00	152787.79
10th	124740.00	152787.79
Total	1247400.00	1527877.90
Average reduction per annum (tCO_2equi)	124740.00	152787.79

emission reductions of the project activity

E4 – E3 = E4- 0 = E4.

Calculation for net emission reduction = E4
Emission factor $EF_{captive,y}$ is Ex-ante based and will remain fixed for the entire crediting period

Year	Net Elec. Generated (EGy)	emission reduction (ERy)
1st	124740.00	152787.79
2n	124740.00	152787.79
3rd	124740.00	152787.79
4th	124740.00	152787.79
5th	124740.00	152787.79
6th	124740.00	152787.79
7th	124740.00	152787.79
8th	124740.00	152787.79
9th	124740.00	152787.79
10th	124740.00	152787.79
Total ::	1247400.00	1527877.90
Average reduction per annum (tCO_2equi)		152787.79

values obtained when applying formulae above

Year	**Estimation of Project activity emission reduction tonnes of CO_2equi**	**Estimation of baseline emission reduction tonnes of CO_2equi**	**Estimation of leakage tonnes of CO_2equi**	**Estimation of emission reduction tonnes of CO_2equi**
2007-2008	0	152787.79	0	152787.79
2008-2009	0	152787.79	0	152787.79
2009-2010	0	152787.79	0	152787.79
2010-2011	0	152787.79	0	152787.79
2011-2012	0	152787.79	0	152787.79
2012-2013	0	152787.79	0	152787.79
2013-2014	0	152787.79	0	152787.79
2014-2015	0	152787.79	0	152787.79
2015-2016	0	152787.79	0	152787.79
2016-2017	0	152787.79	0	152787.79
Total estimated reduction				1527877.90 tCO_2equi / Credit Period

B.7 Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)	
Data / Parameter:	EGGEN / Electricity
Data unit:	MWh
Description:	Gross electricity generated
Source of data to be used:	The electronic meter provided at the output of turbo generator. The meter reading will be available on DCS continuously and same will be transferred to log book to be maintained by shift engineer , approved by shift in charge as the daily report There is a second meter sealed by CSEB as company has to pay cess on any power generated in CPP. The CSEB meter is calibrated by government department and will be considered as final in case of discrepancies in the readings of two meters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100%
Description of measurement methods and procedures to be applied:	Log book maintained based on DCS data which receive data from meters
QA/QC procedures to be applied:	Log book signed by plant manager daily. Meters calibrated regularly. As CSEB sealed meter is provided the meters are regularly under QC/QA procedure for any variation. If variation is noticed recalibration will be done immediately.
Any comment:	Nil
(Copy this table for each data and parameter)	

Data / Parameter:	EG AUX / Electricity
Data unit:	MWh
Description:	Auxiliary electricity consumption
Source of data to be used:	The electronic meters provided at the supply point to each auxiliary consumption source. The meters readings will be available on DCS continuously and same will be summed up by DCS to arrive total auxiliary consumption. This data is transferred to log book to be maintained by shift engineer , approved by shift in charge as the daily report
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100%
Description of measurement methods and procedures to be	Log book maintained based on DCS data which receive data from meters connected to DCS.

applied:	
QA/QC procedures to be applied:	Log book signed by plant manager daily. Meters calibrated regularly
Any comment:	Nil

(Copy this table for each data and parameter)	
Data / Parameter:	EG y / Electricity
Data unit:	MWh
Description:	Net electricity generated
Source of data to be used:	calculated EG y=EG GEN-EG AUX
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100%
Description of measurement methods and procedures to be applied:	Log book maintained based on DCS data which is based on data from meters connected to DCS.
QA/QC procedures to be applied:	Log book signed by plant manager daily.
Any comment:	Nil

Data / Parameter:	STEAM FLOW QTY, (F8, F9, F10)
Data unit:	T/hr.
Description:	Steam flow from WHRB-3, WHRB-4, and inlet of TG5
Source of data to be used:	The steam flow meter provided at the output of WHRB-3, WHRB-4,inlet of TG5. The meter reading will be available on DCS continuously and same will be transferred to log book to be maintained by shift engineer , approved by shift in charge as the daily report
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100%
Description of measurement methods and procedures to be applied:	Log book maintained based on DCS data which receive data from meters
QA/QC procedures to be applied:	Log book signed by plant manager daily. Meters calibrated regularly. The meters are regularly under QC/QA procedure.
Any comment:	Nil

Data / Parameter:	Steam Temp(T8,T9)
Data unit:	^0C
Description:	Steam Temperature in outlet of WHRB-3, WHRB-4.
Source of data to be used:	The temperature meter provided at the output of WHRB-3, WHRB-4. The meter reading will be available on DCS continuously and same will be transferred to log book to be maintained by shift engineer, approved by shift in charge as the daily report
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100%
Description of measurement methods and procedures to be applied:	Log book maintained based on DCS data which receive data from meters
QA/QC procedures to be applied:	Log book signed by plant manager daily. Meters calibrated regularly. The meters are regularly under QC/QA procedure. Manager –In- Charge would be responsible for regular calibration of meter.
Any comment:	Nil

Data / Parameter:	Steam Pressure (P8,P9)
Data unit:	kg/cm^3
Description:	Steam pressure in outlet of WHRB-3, WHRB-4.
Source of data to be used:	The pressure gauge (meter) provided at the output of WHRB-3, WHRB-4. The meter reading will be available on DCS continuously and same will be transferred to log book to be maintained by shift engineer, approved by shift in charge as the daily report
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100%
Description of measurement methods and procedures to be applied:	Log book maintained based on DCS data which receive data from meters
QA/QC procedures to be applied:	Log book signed by plant manager daily. Meters calibrated regularly. The meters are regularly under QC/QA procedure. Manager –In- Charge would be responsible for regular calibration of meter.
Any comment:	Nil

B.7.2 Description of the monitoring plan:

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MONITORING PLAN

The methodology requires monitoring the following

1. Net electricity generation from the proposed project activity
2. Data needed to calculate the emission factor of captive power generation.

GPIL have prepared and adopted the monitoring plan with the aim that complete integrity and transparency shall be maintained during monitoring in the following manner.

1. Data monitoring and maintaining records of readings /printouts of readings from installed instrumentation;

2. 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
3. Monthly report on steam generation and consumption

Section- D gives reporting tables to be followed.

Monitoring of Steam

1. Why steam is monitored?

The project activity will generate power from a common turbine by drawing steam from the two WHRB (i.e. the new project activity) up-to 25 MW. Hence for cross verification of the exact quantity of power generated from the WHRB the quantity & quality of Steam is monitored from all sources. This helps to transparently and reliably calculate the exact power generated due to the project activity.

2. What is the aim of monitoring of steam?

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

3. Calculation of Net Power Generated from two WHRBs(3&4) of New Project Activity:
To achieve the above we follow the steps below

(A) Steam flow to TG5 = F_{10}

(B) Gross Electricity Generated = Me_8
TG5)

(C) Auxiliary Load / self power consumed by the CPP = Me_9

(D) Net Electricity Generation by the TG = (B) – (C)
(Gross Elec. Generated- Aux. Load)

Table for monitoring

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-3, WHRB-4. • Temperature and pressure of steam from WHRB's. • Net quantity of steam available from the waste heat recovery boiler's for electricity generation in 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 net steam flow from WHRB-3,WHRB-4 after the vent before the common header entry port. • Flow meter for steam inlet to turbine TG5. • Temperature gauge for WHRB-3, WHRB-4. • Pressure gauge for WHRB-3, WHRB-4.
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 two nos 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	**<u>Metering System of CSEB</u>** 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 by 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 Vice president/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 meters maintained at site.

B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

>>

Date of Completion of baseline study : 30-12-2006

Name of the Monitoring methodology :
Consolidated monitoring methodology for waste gas and/or heat and/or pressure for power generation ACM0004 /version 02; Sectoral Scope: 01, 03 March 2006.

Name of Entity : Indus Financial and Technical Consultants Ltd
Name of Persons : Lalit Kumar Singhania
Vikas Thakur

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>

29-October-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:

C.2.2.1. Starting date:

>>

01-3-2007 or From the date of CDM registration of project activity.

C.2.2.2. Length:

>>

Fixed crediting period is 10 years.

SECTION D. Environmental impacts

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

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The Project activity is to produce 25 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 900^0C into atmosphere. Project activity recovers the waste heat and save; energy and reduces thermal emission by controlling gas temperature below 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 economical 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.

D.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 prescribed limits level in the nearby villages. In the plant the noise level is kept below 90dB.

Thermal Pollution:

In business as usual scenario, the heat from flue gases let out would be let out into atmosphere 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 170^0C and hence thermal pollution is reduced considerably.

Air emission:

An ESP provided at the outlet of boiler effectively reduces the fugitive dust level to 50 mg/Nm^3 while acceptable legal National 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 E. Stakeholders' comments

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E.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 Industrial Development Corporation (CSIDC)

E.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 have expressed their no objection for project activity

The salient details are as under.

After company officials explained the project activity following questions were raised during meeting and replied.

Question	Reply
1. Whether local people will be employed ?	GPIL replied that employment of technical people will be based on the availability of technically qualified people from local area. However for the non technical category ,maximum selection will be done from local people
2 Regarding Dust content	ESP will reduce dust content and will meet CECB regulation & emission norms.
3. Regarding noise pollution	Company will follow regulations of government & noise levels will be maintained within the prescribed norms.

4. Regarding fly ash	Fly ash is collected in ESP. GPIL informed that fly ash is created in sponge iron kiln and WHRB power plant does not create any fly ash. Fly ash will be supplied free of cost to brick & cement industry.

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, CSIDC, Boiler Inspector, etc. wherever required legally and have been received and other State agencies have been apprised of the project activity

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

>>

No negative comment was reported from stake holders.

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:	Environment
Mobile:	+91 98271 30743
Direct FAX:	
Direct tel:	
Personal E-Mail:	lkp46@sify.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

NO PUBLIC FUNDING IS INVOLVED.

ANNEX 3

BASELINE INFORMATION

Base line information (sources of information)

1. CO2 emission factor for coal in captive power generation (t C/TJ) EF CO2 is based on IPCC factor

2. Manufacturers data for 25 MW turbine & 25 MW WHRB. The steam requirement per MW power generation of 30 MW TG is the lowest as compared to existing TG's hence adopted as conservative approach.

3. Boiler efficiency considered as 100% as per OPTION B of methodology

4. Calculated EFCO2 =1.225 tonnes CO2/MWH

Annex 4

MONITORING INFORMATION

MONITORING PLAN

The methodology requires monitoring the following

1. Net electricity generation from the proposed project activity
2. Data needed to calculate the emission factor of captive power generation.

GPIL have prepared and adopted the monitoring plan with the aim that complete integrity and transparency shall be maintained during monitoring in the following manner.

1. Data monitoring and maintaining records of readings /printouts of readings from installed instrumentation;

2. 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
3. Monthly report on steam generation and consumption

Section- D gives reporting tables to be followed.

Monitoring of Steam

1**. Monitoring Concept:**

The WHR CDM CPP (New facility of the Project Activity) having 25 MW power generation potential is being installed as a planned expansion in the capacity of the industrial project, little away from the existing facility of 11 MW Coal fired FBB, 7 MW WHRB-1, and WHRB-2 -10 (a registered CDM Project). As per the approved methodology ACM0004 the 25 MW project is treated as new facility.

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

3. Why steam is monitored?

The project activity will generate power from turbine by drawing steam from the two WHRBs (i.e. the project activity WHRB3 & 4) up-to 25 MW, to cross verify the exact quantity of power generated from the WHRB3 & 4, the quantity & quality of Steam is monitored. This helps to transparently and reliably calculate the exact power generated due to the project activity.

4. What is the aim of monitoring of steam?

To exactly define how much steam is generated from two new WHRBs (project activity) and how much of the steam is consumed in Steam turbine generator. By using this data to calculate exact electricity generated by the two new WHRB project activity for the cross verification with the metered power generation. This is essential to establish CO_2 reduction emission by the project activity.

In order to most transparently and accurately monitor the net power generated from the project activity WHR CDM CPP (i.e.25 MW WHRB-3&4) the following monitoring arrangements are proposed:

(A) Monitoring of Steam at New Facility :

(1) Monitoring of the net quantity (enthalpy-$H_{1, H2}$) of steam fed by the WHRB-3&4 to TG5 through common header, by installing the steam flow meter ($F_{8,}$ & F9) with temperature and pressure gauges (T9 & T10, P9& P10), after the vent of WHRB-3&4 and before the common header..

(2) Monitoring of the net quantity (enthalpy-H_3) of steam consumed by the TG5; by installing independent steam flow meter. (F10)

(B) Monitoring of Waste Heat Power Generation

(1) The total power generated by new facility TG5 is monitored online through the independent energy meters (Me_8);.

(2) The total Auxiliary power consumed in CPP is monitored online and independently by energy meters (Me9).

(3) Calculation of Waste Heat Power Generation from WHRB-3&4:
The gross power generation from WHRB-3&4 is calculated based on Thermodynamic principle of enthalpy of the steam ($H_{1&}$ H_2) contributed by WHRB-3&4 out of the total Enthalpy of steam fed to TG5 (H_3) through the common header in prorated proportion.

(4) The net power generated by the project activity- WHRB-3&4 can be calculated for cross verification by deducting the proportionate auxiliary power consumption from the gross power generation due to WHRB-3&4

(5) Enthalpy of all steam source are calculated in terms of Kcal by using the average temperature and pressure and net quantity of steam delivered from the each individual particular source.

It is thus evident that the power generation from the project activity shall be calculated based on proportion of Enthalpy of steam provided by it to the TG set for power generation. Therefore to monitor and archive the required data following monitoring steps will be done:

$EG_{GEN\ CPP}$ = Installing energy meters Me8 at the TG_5

$St_{TOTAL\ CPP}$ = Installing meters for monitoring flow of steam at the inlet of TG5 meter F10.

$EG_{AUX\ CPP}$ = Monitoring the power consumed through the common transformer at CPP by installing the energy meters at the auxiliary power consuming points (Me_9.

St_{pa} = Installing meter for monitoring of temperature, pressure and flow of steam at the inlet of the new facility common header on the duct coming from WHRB-3&4.

The following will be monitored:

1	Net Enthalpy of the Steam (H_{1+H2}) provided by the Project Activity i.e. WHRB-3&4	St_{WHRB-2}	A
2	Total enthalpy of the steam consumed by the TG(TG5) (H_3)	St_{TOTAL}	B
3	Total power generated by the TG' (i.e. TG5) (Me_8)	$EG_{GEN\ CPP}$	C
4	Total Power consumed by the Auxiliaries (Me9)	$EG_{AUX\ CPP}$	D

A.

3. Calculation of Net Power Generated from two new WHRBs New Project Activity:

To achieve the above we follow the steps below

(A) Steam flow to TG5 = F_{10}

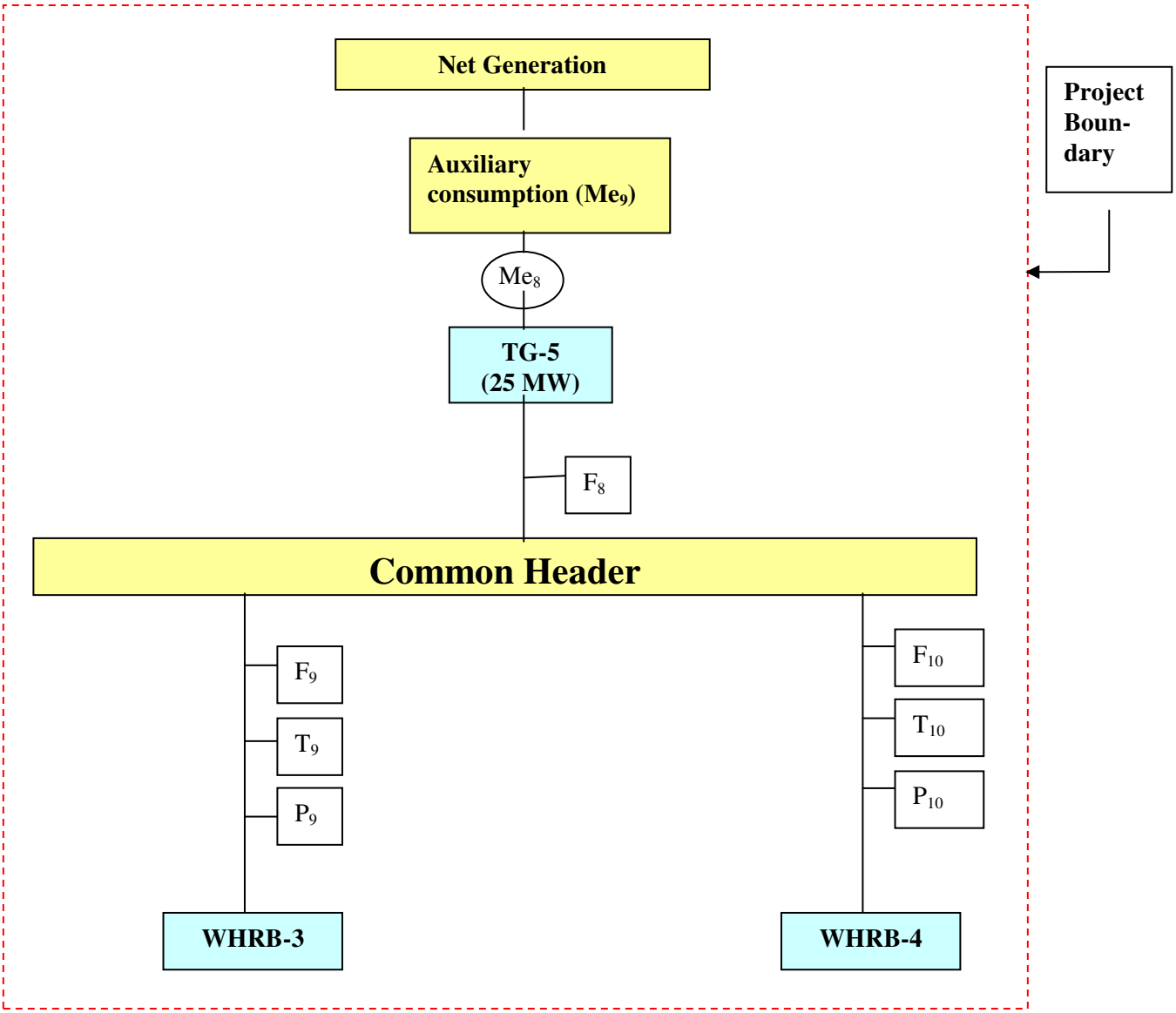
(B) Gross Electricity Generated TG5) = Me_8

(C) Auxiliary Load / self power consumed by the CPP = Me_9

(D) Net Electricity Generation by the TG = (B) – (C) (Gross Elec. Generated- Aux. Load)

INSTRUMENTATION CHART

Monitoring Plan



Steam Monitoring Parameter	Metering Point
Pressure at Outlet of WHRB-3	P_4
Temperature at Outlet of WHRB-3	T_4
Flow of steam in M^3/hr at the Outlet of WHRB-3	F_8
Pressure at Outlet of WHRB-3	P_5
Temperature at Outlet of WHRB-4	T_5
Flow of steam in M^3/hr at the Outlet of WHRB-4	F_9
Net Flow of steam into TG-5	F_{10}

Electrical Parameter

Electrical Monitoring Parameter	
Gross Power Generation from TG-5	Me_8
Gross Power consumed in Auxiliary loads at CPP	Me_9

Table for monitoring

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-3, WHRB-4. • Temperature and pressure of steam from WHRB's. • Net quantity of steam available from the waste heat recovery boiler's for electricity generation in 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 TG Set. • In house metering system of GPIL (for metering the generation of power, auxiliary consumption, wheeling through CSEB grid) • Flow meters for monitoring net steam flow from WHRB-3,WHRB-4 after the vent before the common header entry port. • Flow meter for steam inlet to turbine TG5. • Temperature gauge for WHRB-3, WHRB-4. • Pressure gauge for WHRB-3, WHRB-4.
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 two nos 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.
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