**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:

>>
Generation of electricity through waste heat recovery from non recovery type coke oven batteries and blast furnace gas at SISCOL , Salem District, Tamil Nadu, India.
Version: 01
Date: 15/10/2007

### A.2. Description of the project activity:

>>
The project activity involves setting up of a power plant to generate 30MW electricity through waste heat recovery from non recovery type coke oven batteries and Blast Furnace gases. The project activity is located in the Southern Iron and Steel Company Limited (SISCOL) Salem, Tamilnadu. At the time of project conceptualization, it was decided to install two numbers of Non-recovery type Coke Oven gas based Waste Heat Recovery Boilers (WHRB) of 45 TPH each and a 32 TPH Blast Furnace Gas Fired Boiler (BFGFB).

Under the project activity, SISCOL would collect and supply all the coke oven flue gases (COFG) from the Non-recovery Coke Oven plant and the excess cleaned Blast Furnace Gas (BFG), not utilized in the manufacturing process of SISCOL to the project activity.

The project activity i.e. the Power Plant was set up by another company called JSW Power Limited, Unit–III which is a captive power plant with installed capacity of 60 MW (30MW based on coal as a fuel + 30 MW based on waste gas/waste heat as fuel) commissioned to generate and supply power to SISCOL, incorporated on 17$^{th}$ January 2005. Subsequently it was merged with JSW Steel Limited (Bombay High Court order dated 30$^{th}$ September 2005). Later on JSW Power Limited – III was acquired by SISCOL[1].

Since the power generation from waste heat recovery from Non-recovery type Coke Oven batteries and Blast Furnace gases is not reliable and drawing on the experience of a similar project based on similar technology in JSW Steel (where it was not possible to generate the full power due to the uncertainty in the gas from the coke oven plant and Blast Furnace), it was decided to install another 30 TPH coke oven gas based waste heat recovery boiler.

The power generated by the project activity, a first of its kind in the region would be used to cater to the power requirements of SISCOL – which otherwise would have been met by either having a captive coal based power plant which is common practice or by purchasing it from an Independent Power Producer. The project activity will involve an additional investment of INR 140 million (for the additional 30 TPH coke oven gas based boiler) over and above the investment of approximately INR 750 million for the waste heat/waste gas based power plant. With more and more fossil fuel based mega and ultra mega power projects being conceptualized in India to satisfy its burgeoning power demand especially from the industrial units, the

[1] Evidence will be provided to DOE

introduction of such small scale generation schemes and also utilizing waste heat or waste gas is therefore a positive step towards reducing the dependence on fossil fuels.

**Contribution of the project activity to sustainable development**

Ministry of Environment and Forests, Govt. of India has stipulated the social well being, economic well being, environmental well being and technological well being as the four indicators for sustainable development in the host country approval eligibility criteria for Clean Development Mechanism (CDM) projects[2].

**Social well being**

- Development will occur through the direct and indirect employment of approximately 100 people at the site as a result of the implementation of the project.
- The region is facing more than 8% peak power deficit[3] leading to power shortages/outages and hence the project activity enables the regional grid to partially bridge this gap by company not taking power from grid. This helps the grid to supply power to other consumers.

**Environmental well being**

- It reduces the environmental load per unit of electricity generation by avoidance of coal for power generation. Accordingly project activity reduces average emission of $SO_{x,}$ SPM and average solid waste generation.
- This project activity has resulted in reduction of greenhouse gases emissions (GHGs) into the atmosphere, which would have been generated from the equivalent amount of coal fired power plant.
- Also the project activity helps in utilization of waste gas which otherwise would have been flared away.

**Economic well being**

- This project will demonstrate the use of new financial mechanism (CDM) in raising finance for power generation from waste gases.
- This project will develop the local economy and create employment opportunities, particularly in a rural area, which is a priority concern of the Government of India.

**Technological well being**

- The project activity is innovative and is a step to apply the new technology to utilize waste heat from non-recovery type coke ovens.

| A.3. | Project participants: |
|---|---|

>>

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[2] http://cdmindia.nic.in/host_approval_criteria.htm

[3] www.epwrf.res.in/upload/MER/mer10703005.pdf

| Name of Party involved (*) ((host) indicates a host Party) | Private and/or public entity (ies) project participants (*) (as applicable) | Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No) |
|---|---|---|
| Government of India (Host) | SISCOL (Project proponent) | No |

**A.4. Technical description of the project activity:**

**A.4.1. Location of the project activity:**

>>

**A.4.1.1. Host Party(ies):**

>>
Government of India

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

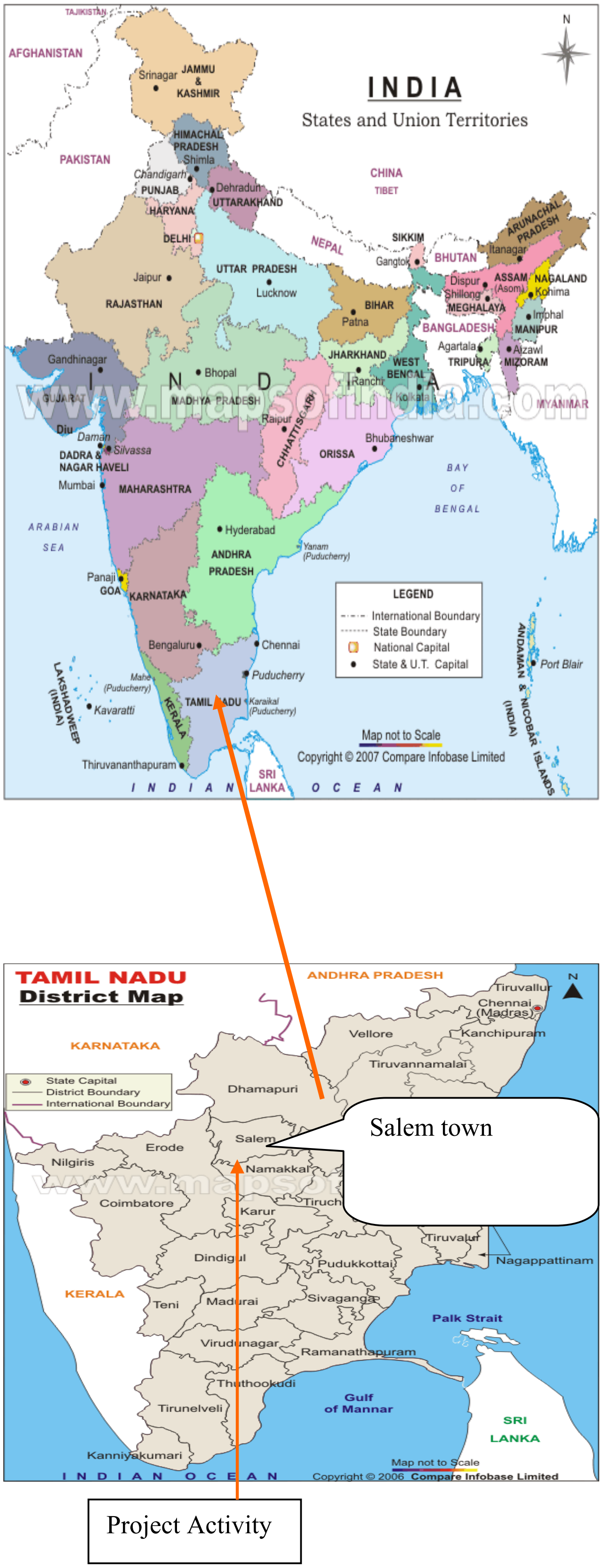
>>
Tamil Nadu

**A.4.1.3. City/Town/Community etc:**

>>
Salem

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

>>
The power plant (in the project activity) is located to the south east of the Blast Furnace and Coke Oven plant in SISCOL premises. The geographical location is 77°51’10”E latitude and 11°49’00”N longitude. The project site is located at Pottaneri/ M.Kalipatti village of Mettur Taluk is Salem District of Tamil Nadu state. The plant is located near the state highway connecting Mecheri Town with Mettur. It is 2 km from Mecheri town and 32 km from Salem and 15 km from Mettur. It is 18 km away from Omalur on National high way NH 7 (Bangalore-Salem). It is very near to Mecheri Road Railway Station on Salem - Mettur sector of Southern Railways, another village road from Mecheri town to Nangavalli is on the eastern side of the plant.


INDIA
States and Union Territories
AFGHANISTAN
PAKISTAN
CHINA
TIBET
NEPAL
BHUTAN
BANGLADESH
MYANMAR
SRI LANKA
JAMMU & KASHMIR
Srinagar
HIMACHAL PRADESH
Shimla
Chandigarh
PUNJAB
HARYANA
Dehradun
UTTARAKHAND
DELHI
UTTAR PRADESH
Lucknow
Jaipur
RAJASTHAN
BIHAR
Patna
SIKKIM
Gangtok
ARUNACHAL PRADESH
Itanagar
ASSAM
Dispur
NAGALAND
Kohima
Shillong
MEGHALAYA
Imphal
MANIPUR
Agartala
TRIPURA
Aizawl
MIZORAM
Gandhinagar
GUJARAT
Bhopal
MADHYA PRADESH
JHARKHAND
Ranchi
WEST BENGAL
Kolkata
Raipur
CHHATTISGARH
Bhubaneshwar
ORISSA
Diu
Daman
Silvassa
DADRA & NAGAR HAVELI
Mumbai
MAHARASHTRA
Hyderabad
ANDHRA PRADESH
Yanam (Puducherry)
Panaji
GOA
KARNATAKA
Bengaluru
Chennai
Puducherry
Mahe (Puducherry)
Karaikal (Puducherry)
TAMIL NADU
KERALA
Kavaratti
LAKSHADWEEP (INDIA)
Thiruvananthapuram
ANDAMAN & NICOBAR ISLANDS (INDIA)
Port Blair
ARABIAN SEA
BAY OF BENGAL
INDIAN OCEAN
LEGEND
International Boundary
State Boundary
National Capital
State & U.T. Capital
Map not to Scale
Copyright © 2007 Compare Infobase Limited
TAMIL NADU
District Map
ANDHRA PRADESH
KARNATAKA
KERALA
State Capital
District Boundary
International Boundary
Tiruvallur
Chennai (Madras)
Vellore
Kanchipuram
Tiruvannamalai
Dhamapuri
Salem
Erode
Nilgiris
Namakkal
Coimbatore
Karur
Tiruvalur
Nagappattinam
Dindigul
Pudukkottai
Teni
Madurai
Sivaganga
Virudunagar
Ramanathapuram
Thuthookudi
Tirunelveli
Kanniyakumari
Palk Strait
Gulf of Mannar
SRI LANKA
INDIAN OCEAN
Map not to Scale
Copyright © 2006 Compare Infobase Limited
Salem town
Project Activity

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

>>

As per the scope of the project activity listed in the "List of Sectoral scopes" (Document CDM-ACCR-06 version 04)', the project activity will principally fall in Scope Number 1, Sectoral scope – energy industries renewable/ non-renewable sources) and Scope Number 4,Sectoral Scope – Manufacturing industries.

The CDM PDD is based on approved methodology ACM 0012 version 01 and sectoral scope 01 and 04, EB 32 "**Consolidated baseline methodology for GHG emission reductions for waste gas or waste heat or waste pressure based energy system"**

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

>>

Under the project activity, the waste heat from coke oven flue gases (COFG) from the Coke Oven Plant and the excess Blast Furnace Gas (BFG) shall be utilized for power generation. The non recovery type of coke ovens are environmentally safe and waste heat recovery from these coke oven is inherently uncertain and is not prevalent. In this project activity 243,277 Nm3/hr of coke oven flue gases generated from coke oven batteries at 1050 deg C is utilized for power generation by sensing/recovering the waste heat through the installation of two nos. 45 TPH natural circulation single drum Waste Heat Recovery Boilers having a main stream pressure at 94kgf/cm2. In this Boiler there are three Economizers which help to recover the waste heat from the flue gas which in turn increase the efficiency of Boilers. The boilers have been supplied by M/s Thermal Systems Hyderabad (P) Limited

As mentioned earlier, at the time of conceptualization of this project activity there was no plant in India operational on coke oven gas based power generation technology and hence SISCOL was unaware about the uncertainties involved in power generation with this type of technology. But later on looking at the poor performance of a coke oven unit of JSW Steel Limited where in only 60MW to 70MW of the planned 100MW capacity was generated, SISCOL has modified its plans to install an additional 30 TPH natural circulation single drum waste heat recovery boilers to mitigate the risk of reduced power availability to the steel plant and for maximum utilization of the installed generation capacity.

Also the Blast Furnace at SISCOL, having a hot metal production capacity of 0.616 Million TPA will generate 36000 Nm3/hr of BF gas in excess, after in-house consumption. This excess BF gas which otherwise would have been flared will be utilized for power generation by installing a 32TPH single drum Blast furnace gas fired boiler having a main stream pressure at 94kgf/cm2. The boiler has been supplied by M/s Thermal Systems Hyderabad (P) Limited.

The gas is burnt in the furnace of the boiler. The walls of this furnace are water tubes welded to each other. The water circulated through the water wall tubes absorb the heat and converted in to steam. The water – steam mixture goes to the steam drum where the steam is separated. The process of passing through super heater tubes arranged within the furnace leads to the super heating of the steam. This high pressure and high temperature is less than rooted to a steam turbine. The thermal energy is converted in to mechanical energy by expansion of steam (through reduction in its temp & press) in the turbine. This rotational energy is used drive the generator which produces electricity.

The combined steam from WHRB (3 nos.) and BF Gas fired boiler are taken through a main steam line and admitted to Steam turbine for power generation.

Steam from the turbine is condensed in the condenser. Cooling water is circulated through the condenser to condense the steam. The condensate is pumped through low-pressure heater to a deaerating unit. The LP heater supplied with the steam extracted from the LP stage after turbine for heating the condensate. From the deaerator that removes the Dissolved oxygen, water is pumped to the boiler by means of Boiler feed pump which is provided for improving the thermal efficiency of the cycle.

A demineralizing plant meets the demineralized water requirement for the feed water makeup to the boiler. It also includes closed circuit cooling water from the condenser outlet cooled in an Induced draft-cooling tower.

The combined steam from Waste Heat Recovery Boilers and Blast Furnace Gas fired Boiler are capable to generate around 30MW. The total installed capacity of power plant is 60MW of which 30MW of power is generated through coal fired boiler and 30MW through waste heat recovery boilers and the BF gas fired boiler. In the case wherein the waste gas/waste heat based power generation will be more than 30MW equivalent amount of coal based power generation will be reduced.

## Plant Overview (WHRB 1 & 2)

CW - Cooling Water

CEP - Condensate Extraction Pump

SJAE - Steam Jet Air Ejector

DA - De Aerator
LPH - Low Pressure Heater
BFP - Boiler Feed Pump
IDF - Induced Draft Fan
GEN - Generator

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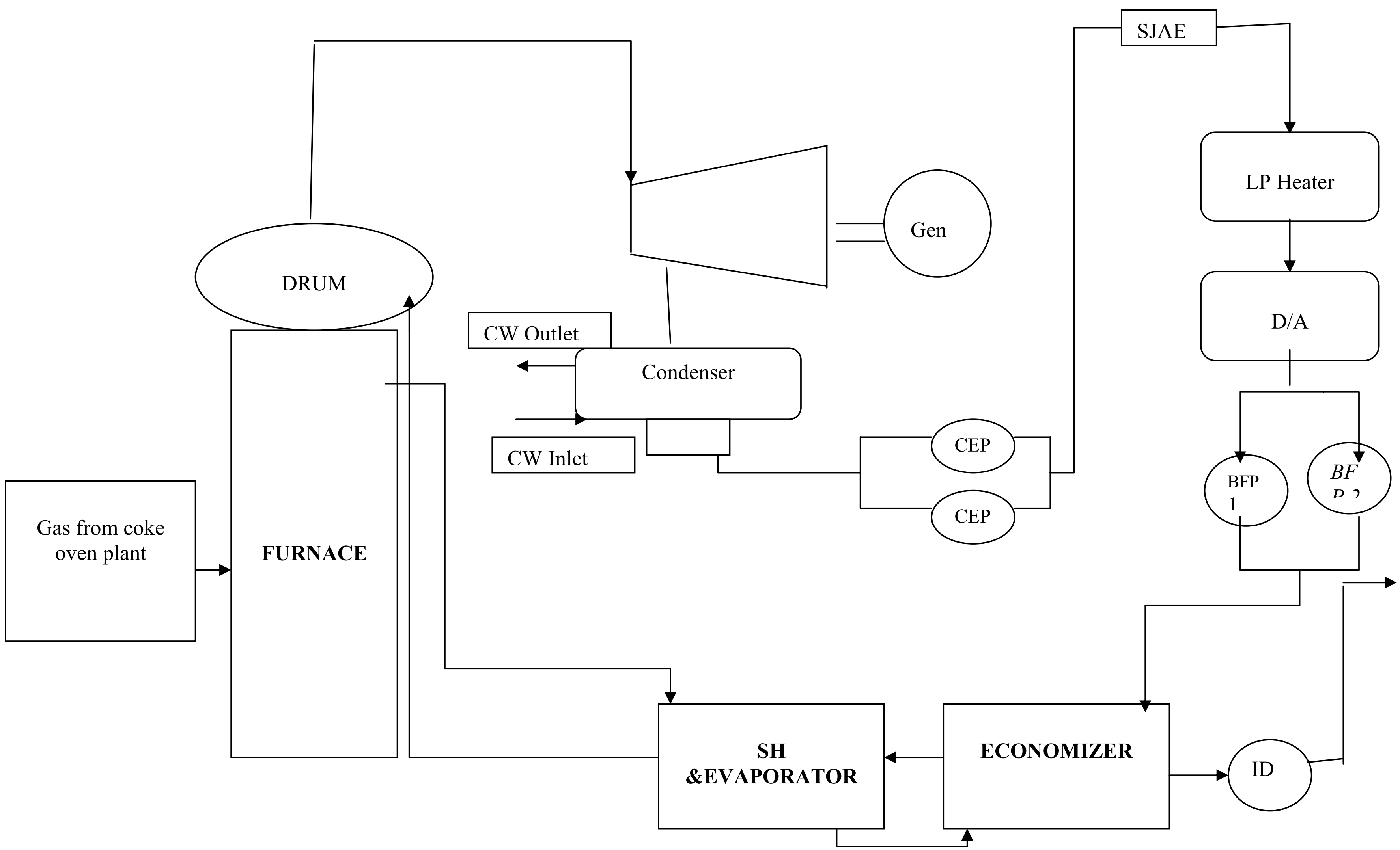
SJAE
LP Heater
Gen
DRUM
D/A
CW Outlet
Condenser
C
H
I
M
N
Y
CEP
CW Inlet
BFP
1
BF
CEP
Gas from coke
oven plant
FURNACE
SH
&EVAPORATOR
ECONOMIZER
ID

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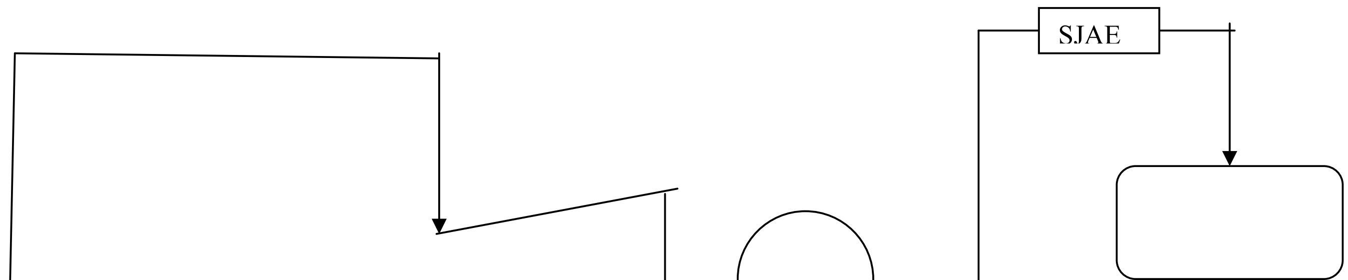
## Plant Overview (BF Gas fired boiler)

**CW** - **Cooling Water**
**CEP** - **Condensate Extraction Pump**
**SJAE** - **Steam Jet Air Ejector**
**DA** - **De Aerator**
**LPH** - **Low Pressure Heater**
**BFP** - **Boiler Feed Pump**
**IDF** - **Induced Draft Fan**
**GEN** - **Generator**



**A.4.4 Estimated amount of emission reductions over the chosen crediting period:**

>>

| Total Chosen Crediting period | |
|---|---|
| **Years** | **Annual estimation reductions in tonnes of $CO_2$ e** |
| Year A* | 291368 |
| Year B | 291368 |
| Year C | 291368 |
| Year D | 291368 |
| Year E | 291368 |
| Year F | 291368 |
| Year G | 291368 |
| Year H | 291368 |
| Year I | 291368 |
| Year J | 291368 |
| **Total estimated reductions (tonnes of $CO_2$ e)** | **2913680** |
| Total number of crediting years | **10** |
| Annual average over the crediting period of estimated reductions (tonnes of $CO_2$ e) | **291368** |

* Year A starts from the date of registration of the project activity

**A.4.5. Public funding of the project activity:**

>>

No public funding or Overseas Development Assistance is used 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:**

>>

***The approved methodology and the version of the methodology that is used:***

Title: **"Consolidated baseline methodology for GHG emission reductions for waste gas or waste heat or waste pressure based energy system"**

Reference: Approved consolidated baseline methodology ACM0012 Version 01, Sectoral Scope: 01 and 04, EB 32.

***Any methodologies or tools which the approved methodology draws upon and their version:***

Title: **"Tool for Demonstration and assessment of additionality"** Version 03

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

>>

*The consolidated methodology is for project activities that utilize waste gas and/or waste heat as an energy source for:*

- *Cogeneration; or*
- *Generation of electricity; or*
- *Direct use as process heat source; or*
- *For generation of heat in element process3 (e.g. steam, hot water, hot oil, hot air)*

In this project activity the waste heat from flue gases of Coke Oven and waste gas from Blast Furnace that is generated during the manufacturing process of coke and hot metal respectively utilized for power generation.

The methodology is applicable under the following condition

| **Applicability Condition as per ACM 0012** | **Justification** |
|---|---|
| If project activity is use of waste pressure to generate electricity, electricity generated using waste gas pressure should be measurable. | The project activity is not using of waste pressure for power generation. Hence the condition is not applicable. |
| Energy generated in the project activity may be used within the industrial facility or exported outside the industrial facility; | In the project activity, the electricity generated is being used within the industrial facility of SISCOL. |
| The electricity generated in the project activity may be exported to the grid | The electricity generated is used for the consumption within the industrial facility of SISCOL. No electricity is exported to grid. |
| Energy in the project activity can be generated by the owner of the industrial facility producing the waste gas/heat or by a third party (e.g. ESCO) within the industrial facility. | In the project activity, the waste heat/waste gas produced during the manufacturing process of SISCOL is used for electricity generation by SISCOL (At the time of planning of the project activity it was JSW Power Limited, Unit - III) in the same premises. |
| Regulations do not constrain the industrial facility generating waste gas from | There is no regulation or any planned regulation that constrain SISCOL from using fossil fuels. |

| | |
|---|---|
| using the fossil fuels being used prior to the implementation of the project activity. | |
| The methodology covers both new and existing facilities. For existing facilities, the methodology applies to existing capacity. If capacity expansion is planned, the added capacity must be treated as a new facility. | The project activity takes place during and after the capacity expansion of steel plant. |
| The credits are claimed by the generator of energy using waste gas/heat/pressure. | The credits are being claimed by SISCOL. In the project activity SISCOL is the industrial facility as well as the power generator and user. The waste heat/waste gas produced during the steel manufacturing process of SISCOL is used for electricity generation by SISCOL in the same premises. |
| For those facilities and recipients, included in the project boundary, which prior to implementation of the project activity (current situation) generated energy on-site (sources of energy in the baseline), the credits can be claimed for minimum of the following time periods:<br>• The remaining lifetime of equipments currently being used; and<br>• Credit period. | The project activity is taking place at a facility where capacity expansion is taking place. Hence the credits are being claimed for the credit period as the life time of the equipments being used are more than the crediting period. |
| Waste gas/pressure that is released under abnormal operation (emergencies, shut down) of the plant shall not be accounted for. | The waste gas released under abnormal condition will not be accounted. |
| Cogeneration of energy is from combined heat and power and not combined cycle mode of electricity generation. | In the project activity only electricity is generated. Hence this condition is not applicable. |

| | |
|---|---|
| The waste gas/pressure utilized in the project activity was flared or released into the atmosphere in the absence of the project activity at existing facility. This shall be proven by either one of the following:<br>• By **direct measurements** of energy content and amount of the waste gas for at least *three years* prior to the start of the project activity.<br>• **Energy balance** of relevant sections of the plant to prove that the waste gas/heat was not a source of energy before the implementation of the project activity. For the energy balance the representative process parameters are required. The energy balance must demonstrate that the waste gas/heat was not used and also provide conservative estimations of the energy content and amount of waste gas/heat released.<br>• **Energy bills** (electricity, fossil fuel) to demonstrate that all the energy required for the process (e.g. based on specific energy consumption specified by the | The project activity is undertaken at a new steel plant expansion facility. Due to non availability of any historic data **Process plant** manufacturer's original specification/information, schemes and diagrams from the construction of the facility has been used as an estimate of quantity and energy content of waste gas/heat produced for rated plant capacity/per unit of product produced.<br><br>As per manufacturer's information the volume of flue gas generated by Coke Oven is around 243227[4] $NM^3$/hr and volume of waste gas generated by Blast Furnace, after in house consumption is 36,000[5] $NM^3$/ hr respectively.<br><br>The table below provides the detail of the 152 TPH steam that is being fed in the Steam turbo generator.<br><br>(As per information provided by manufacturer)<br><br>(table below) |

| Parameters | WHRB 1 | WHR B 2 | WHR B 3 | BFGF | Unit |
|---|---|---|---|---|---|
| Type of WHRB | Single Drum | Single Drum | Single drum | Single Drum | |
| Capacity of Boiler | 45 | 45 | 30 | 32 | TPH |
| Main steam pressure at MSSV outlet | 94 | 94 | 94 | 94 | Kgf/cm2 |
| Main steam temperature at MSSV outlet | 520 ± 5 | 520± 5 | 520±5 | 520± 5 | C |
| Main steam pressure at Turbine ESV inlet | 84 | 84 | 84 | 84 | Kg/cm2 |

[4] MECC manual for coke oven-Appendix 6 Performance guarantee and performance test-page 28 of 34

[5] Fichtner consulting engineer document no 6244-ME-SPC-100-024 Revision1 Sheet no 72

| | |
|---|---|
| manufacturer) has been procured commercially. Project participants are required to demonstrate through the financial documents (e.g. balance sheets, profit and loss statement) that no energy was generated by waste gas and sold to other facilities and/or the grid. The bills and financial statements should be audited by competent authorities.<br>• **Process plant** manufacturer's original specification/information, schemes and diagrams from the construction of the facility could be used as an estimate of quantity and energy content of waste gas/heat produced for rated plant capacity/per unit of product produced. | |

The above arguments justify that the project activity meets all applicability criteria of the selected approved consolidated methodology ACM0012 and hence is applicable to the project activity.

**B.3. Description of the sources and gases included in the project boundary**

>>

As per ACM 0012,

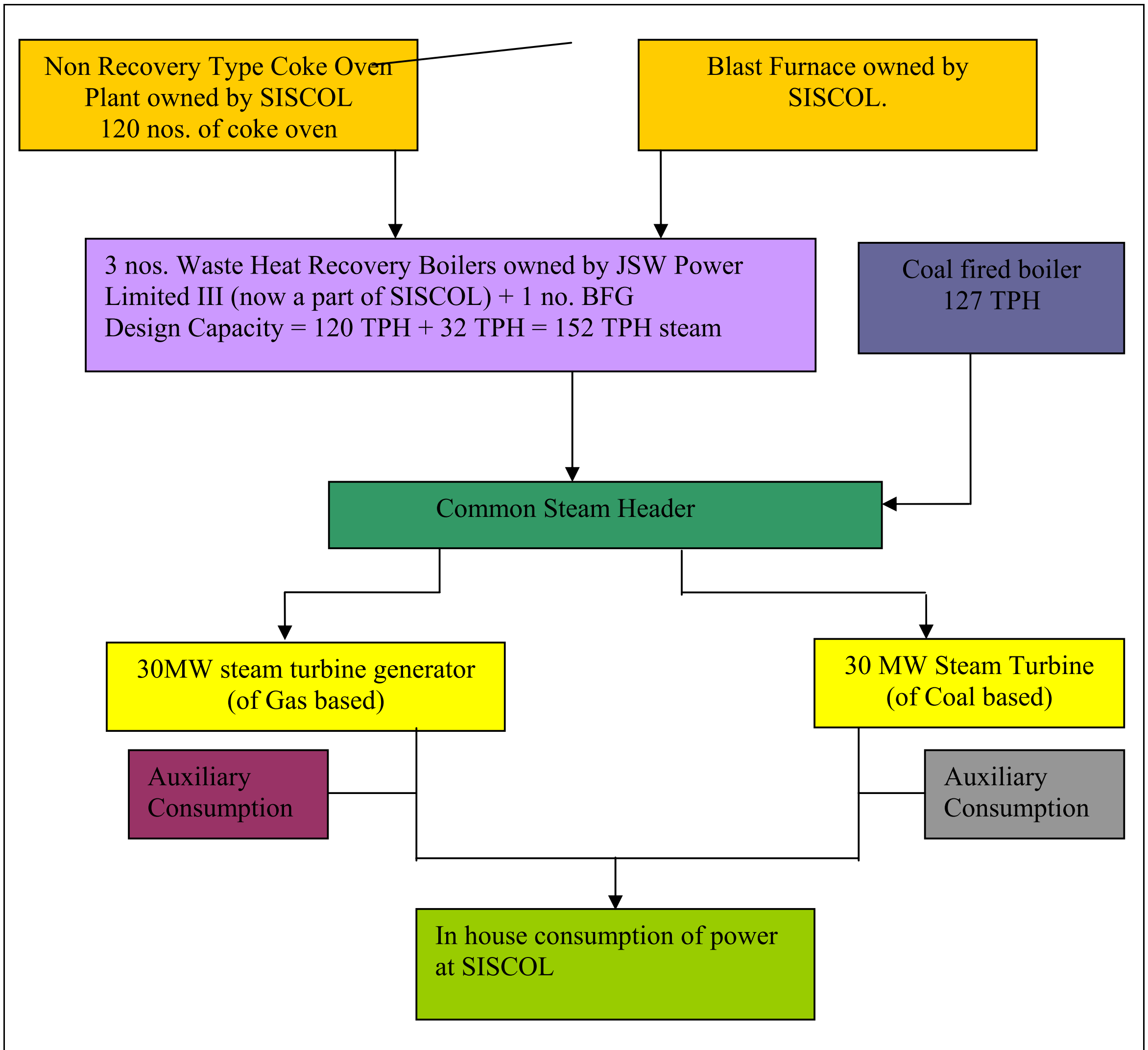
The geographical extent project boundary shall include the following:

*1. The industrial facility where waste gas/heat/pressure is generated (generator of waste energy);*

*2. The facility where process heat in element process/steam/electricity is generated (generator of process heat/steam/electricity). Equipment providing auxiliary heat to the waste heat recovery process shall be included within the project boundary; and*

*3. The facility/s where the process heat in element process/steam/electricity is used (the recipient plant(s)) and/or grid where electricity is exported, if applicable.*

In the baseline scenario, if the WHRB's steam and BFG boiler steam are not available then the electricity would otherwise have been generated by burning additional coal in coal based captive power plant.




| | Source | Gas | Included/ Excluded | Justification/Explanation |
|---|---|---|---|---|
| Baseline | Electricity generation, grid or captive source | $CO_2$ | Included | Main emission source |
| | | $CH_4$ | Excluded | Excluded for simplification. This is conservative. |
| | | $N_2O$ | Excluded | Excluded for simplification. This is conservative. |

| | | | | |
|---|---|---|---|---|
| Project Activity | Supplemental fossil fuel consumption at the project plant | $CO_2$ | Excluded | Main emission source |
| | | $CH_4$ | Excluded | Excluded for simplification. |
| | | $N_2O$ | Excluded | Excluded for simplification. |
| | Supplemental electricity consumption. | $CO_2$ | Included | Main emission source |
| | | $CH_4$ | Excluded | Excluded for simplification. This is conservative. |
| | | $N_2O$ | Excluded | Excluded for simplification. This is conservative. |

**B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:**

>>

The basic assumption of the baseline methodology is that in the absence of the project activity the waste heat/waste gas would have been released into the atmosphere and equivalent electricity would have been generated by operation of fossil fuel based captive power plant.

The approved methodology ACM 0012 Version: 01, EB 32 is used to determine the baseline scenario.

As per ACM 0012,
*The baseline scenario is identified as the most plausible baseline scenario among all realistic and credible alternative(s).*
*Realistic and credible alternatives should be determined for:*

- *Waste gas/heat/pressure use in the absence of the project activity; and*
- *Power generation in the absence of the project activity; and*
- *Steam/heat generation in the absence of the project activity*

*The project participant shall exclude baseline options that:*

- *Do not comply with legal and regulatory requirements; or*
- *Depend on fuels (used for generation of heat and/or power), that are not available at the project site*

***Step 1: Define the most plausible baseline scenario for the generation of heat and electricity using the following baseline options and combinations.***
*The baseline scenario is identified as the most plausible baseline scenario among all realistic and credible alternative(s).*
*Realistic and credible alternatives should be determined for:*

- *Waste gas/heat/pressure use in the absence of the project activity; and*
- *Power generation in the absence of the project activity; and*
- *Steam/heat generation in the absence of the project activity*

**As the project activity involves only electricity generation from waste gas/heat, the plausible baseline scenarios are identified for**

- **Waste gas/heat/pressure generation in the absence of project activity**
- **Power generation in the absence of the project activity.**

*As per ACM 0012, the baseline candidates should be considered for following facilities:*

- *For the industrial facility where the waste gas/heat/pressure is generated; and*
- *For the facility where the energy is produced; and*
- *For the facility where the energy is consumed.*

For the use of waste gas, the realistic and credible alternative(s) may include, *inter alia*:

| **Alternative** | **Description of Alternative** | **Justification** |
|---|---|---|
| **W1** | Waste gas is directly vented to atmosphere without incineration | Since it is required by safety regulations that the waste gas is incinerated and then vented into the atmosphere and hence W1 cannot be an alternative. |
| **W2** | Waste gas is released to the atmosphere after incineration or waste heat is released to the atmosphere (waste pressure energy is not utilized) | The normal practice of steel industry in India is to release waste gas/heat into the atmosphere after incinerating/flaring the waste gas. Hence this is a plausible baseline alternative. |
| **W3** | Waste gas/heat is sold as an energy source | This is not a plausible alternative as there is no industry nearby SISCOL which can use the waste gas/heat as an energy source directly. |
| **W4** | Waste gas/heat/pressure is used for meeting energy demand. | The waste gas/heat can be used either for meeting the heat requirement of various processes in plant or for electricity generation.<br>• The manufacturing process followed at SISCOL does not have any such process requirement where the waste gas (i.e. gas remaining after in house consumption at SISCOL) can be used.<br>• Also the option of generating electricity from the sensible heat/calorific value of waste gas is not a financially feasible alternative as explained in section B.5<br><br>Hence this is not a plausible baseline alternative. |

Hence from the above it can be concluded that alternative **"W 2 - Waste gas is released to the atmosphere after incineration or waste heat is released to the atmosphere (waste pressure energy is not utilized)"** is the only alternative use of waste gas.

For power generation, the realistic and credible alternative(s) may include, *inter alia*

| Alternative | Description | Justification |
|---|---|---|
| **P1** | Proposed project activity not undertaken as a CDM project activity | The main purpose of the project activity is to generate electricity for in-house consumption. This alternative is in compliance with all applicable legal and regulatory requirements. However, it faces investment and technological barrier. (Please refer to section B.5 below for detailed analysis on these barriers) Hence this option is not a part of the baseline scenario. |
| **P2** | On-site or off-site existing/new fossil fuel fired cogeneration plant | The plausibility of on-site/off-site fossil fuel based cogeneration plant is ruled out as there is no steam requirement in SISCOL/no steam requirement in units nearby SISCOL which can make use of the steam produced in the cogeneration plant. |
| **P 3** | On-site or off-site existing/new renewable energy based cogeneration plant | Putting up a new renewable energy based cogeneration plant in not possible as there is neither any steam requirement in SISCOL nor in the units nearby SISCOL which can utilize the steam produced in the cogeneration plant. Hence this is not a plausible alternative. |
| **P 4** | On-site or off-site existing/new fossil fuel based existing captive or identified plant; | The following on site/off site fossil fuel based new captive power plant can be considered as a plausible baseline alternative.<br>1) Coal<br>2) HSD<br>3) Natural Gas |
| **P 5** | On-site or off-site existing/new renewable energy based existing captive or identified plant; | Wind and hydro based renewable energy generation require very high capital investment.<br><br>Hydro based power generation is not a realistic and credible alternative because of the following reasons:<br>• Hydro based power generation potential had exhausted in the state[6].<br>• Also it was realized that over dependence on hydro power generation programmes had made the grid vulnerable at the time of low rainfall[7]. |

[6] As per Tamil Nadu's 10th Five Year Plan Chapter 11-Power

[7] As per Tamil Nadu's 10th Five Year Plan Chapter 11-Power

| | | |
|---|---|---|
| | | Wind Energy based power generation can be considered as a realistic and credible alternative. This alternative has been evaluated further. |
| **P 6** | Sourced Grid-connected power plants. | Sourcing power from the regional grid can be considered as a plausible alternative. |
| **P 7** | Captive Electricity generation from waste gas (if project activity is captive generation with waste gas, this scenario represents captive generation with lower efficiency than the project activity.) | As mentioned in option P 1 the project activity which is captive power generation with waste gas/waste heat is facing investment barriers.<br><br>Hence going for a lower efficiency technology is not a plausible baseline alternative as this option would also face the same barriers of investment as mentioned in Option P 1. Hence this option is not considered for further evaluation. |
| **P 8** | Cogeneration from waste gas (if project activity is cogeneration with waste gas, this scenario represents cogeneration with lower efficiency than the project activity). | The plausibility of waste gas based cogeneration plant is ruled out as there is neither any steam requirement in SISCOL nor any steam requirement in units nearby SISCOL which can make use of the steam produced in the cogeneration plant. |

Hence from the above discussion it can be seen that option

- **P 4 - On-site or off-site existing/new fossil fuel based existing captive or identified plant**
- **P 5 - On-site or off-site existing/new renewable energy based existing captive or identified plant and**
- **P 6 - Sourced Grid-connected power plants can be considered as plausible baseline scenario.**

***STEP 2: Identify the fuel for the baseline choice of energy source taking into account the national and/or sectoral policies as applicable.***

As identified in step I one of the plausible electricity generation baseline scenarios is P 4 - On-site or off-site existing/new fossil fuel based existing captive or identified plant.

The various fuel options with SISCOL for a new fossil fuel based captive electricity generation are:

1. Coal
2. Natural Gas
3. Diesel

*As per ACM 0012 the identified baseline fuel should be available in abundance in the host country and there is no supply constraint.*

**Natural gas** cannot be considered as a realistic option as there in no infrastructure available at the site for the transportation of natural gas.

As India is mainly an oil importer country[8] there is always a possibility of a supply constraint of crude oil due to any national or international crisis.

However **coal** is abundantly available in the nearby region.

Hence from the above it can be concluded that **coal/diesel** based captive power plant can only be considered for further evaluation in Step III.

| **Option** | **Waste Gas** | **Power** | **Baseline fuel** |
|---|---|---|---|
| 1.Waste gas is released to the atmosphere after incineration and on site or off site new fossil fuel based captive power plant | W2 | P4 | Coal/HSD for power generation |

***STEP 3:***

***Step 2 and/or step 3 of the latest approved version of the "Tool for the demonstration and assessment of additionality" shall be used*** to identify the most plausible baseline scenarios by eliminating non feasible options (e.g. alternatives where barriers are prohibitive or which are clearly economically unattractive)

Further as per the methodology the alternatives are to be evaluated on the basis of economic attractiveness to find the appropriate baseline scenario. The broad parameters for the evaluation of sources of power are capital cost and unit cost of electricity purchased or produced.

| Option | Alternative | Cost/MW (INR million) | Unit cost of generation (INR/kwh) | Conclusion |
|---|---|---|---|---|
| 1.Waste gas is released to the atmosphere after incineration and on site or off site | Wind based captive power plant | 44.8[9] | 3.24[10] | As compared to other option wind energy based renewable energy generation require very high capital investment and the unit cost of generation is also |

[8] India imports 70% of the 104 million tonnes of crude oil being used.

[9] The relevant worksheet ' SISCOL_Wind_Generation_2005' will be shown to the DOE

[10] The relevant worksheet ' SISCOL_Wind_Generation_2005' will be shown to the DOE

| | | | | |
|---|---|---|---|---|
| new renewable energy based captive power plant | | | | high.<br><br>Also the wind energy based electricity generation is seasonal and infirm.<br><br>Hence from the above it can be seen that wind energy based power generation is not the most financially attractive option. |
| 2.Waste gas is released to the atmosphere after incineration and on site or off site fuel new fossil fuel based captive power plant | Coal based captive power plant | 40[11] | 2.15[12] | Integrated steel plant like SISCOL have a good accessibility to coal and also has the required infrastructure like coal and fly ash handling facilities for running coal based power plant. And also the cost of unit power generation and investments are lower in comparison to the other alternatives.<br><br>This is the most financially attractive option. |

[11] The relevant worksheet will be shown to the DOE

[12] The relevant worksheet will be shown to the DOE

| | | | | |
|---|---|---|---|---|
| | Diesel based captive power plant | 35[13] | 5.96[14] | Although the capital cost of diesel based power plant is less than that of other alternatives the generation cost is much higher mainly due to higher fuel prices due to scarcity in availability of oil in India.<br><br>Diesel based power generation is generally used as backup/alternate source for supplying electricity under emergency situations in plants of such capacities.<br><br>This is not a financially attractive alternative |
| 3.Waste gas is released to the atmosphere after incineration and source the power from grid connected power plants | Grid based power plant and release the waste gas after incineration in the atmosphere | - | 4.35[15] | Although this alternative doesn't not require any capital investment, it cannot be considered as a financially attractive option for the reasons mentioned below :<br><br>• The electricity purchase rate of approximately Rs. 4.35 per unit is much higher when compared to captive based power generation cost.<br>• Also the company has to face likely power cuts by grid resulting in production loss as the region facing more than 8% peak power deficit[16].<br><br>Hence the option of considering import of electricity from grid is not a financially attractive option. |

[13] Report of Expert committee on fuel for power generation

[14] Report of Expert committee on fuel for power generation

[15] As per Tamil Nadu Electricity Board Invoice

[16] www.epwrf.res.in/upload/MER/mer10703005.pdf

From the above statements it can be seen that the only plausible alternative for integrated steel plant like SISCOL which requires a continuous and reliable power source is to go for a coal based power plant.

Thus the alternative of **captive power generation on-site using coal** is the baseline scenario in this project activity.

*This methodology is only applicable if the baseline scenario, for all the waste gas generator(s) and the recipient plant(s) identified, is one of the two scenarios described in Table below. If the methodology is to be applicable where the waste/gas is used for generating one form of energy only (electricity or heat), then the baseline too should be only generation of one form of energy (electricity or heat respectively).*

***For Project Scenario: Generation of Electricity or Heat only***

| *Scenario* | *Baseline Options* | | *Description of situation* |
|---|---|---|---|
| | *Waste Gas* | *Power/Heat* | |
| *1* | *W2* | *P4 or P6/H4* | *The electricity is obtained from an specific existing plant or from the grid and heat from a fossil fuel based steam boiler.* |

**Applicable Baseline Scenario for SISCOL**

| Scenario | Baseline Options | | Description of situation |
|---|---|---|---|
| | Waste Gas | Power/Heat | |
| 1 | W2 | P4 | Waste gas is released into the atmosphere after incineration and going for an onsite new coal based captive power plant. |

Hence the applicable baseline scenario for this project activity is as per the baseline scenario applicability condition of ACM 0012.

**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): >>**

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 contained in the Flue Gases emitting out of an established industrial manufacturing process i.e. Coke Oven Plant and from calorific value of gas generated from Blast Furnace. Only the waste heat in the flue gases generate from coke oven and calorific value of BF gas will be utilized to generate power, which reduces GHGs emission into the atmosphere. In the absence of the proposed project activity power requirement would have been met by generating captive electricity from coal. Hence project activity achieves reduction in $CO_2$ emission due to avoidance of use of coal and the waste heat/waste gas would have been let into atmosphere/flared for equivalent amount of power generation.

As required by the approved methodology, the additionality of the project activity shall be demonstrated and assessed using the latest version of the “Tool for the demonstration and assessment of additionality” (Version 3) agreed by the CDM Executive Board, available at the United Nations Framework Convention on Climate Change (UNFCCC) CDM web site.

Steps followed under the “Tool for the demonstration and assessment of additionality” are as follows:

**Step 1. Identification of alternatives to the project activity consistent with current laws and regulations**

**Sub-Step 1a: Define alternatives to the project activity.**
*1. Identify realistic and credible alternative(s) available to the project participants or similar project*
*Developers that provide outputs or services comparable with the proposed CDM project activity.*

*These alternatives are to include:*
*• The proposed project activity undertaken without being registered as a CDM project activity;*
*• Other realistic and credible alternative scenario(s) to the proposed CDM project activity scenario that deliver outputs and on services (e.g. electricity, heat or cement) with comparable quality, properties and application areas, taking into account, where relevant, examples of scenarios identified in the underlying methodology;*
*• If applicable, continuation of the current situation (no project activity or other alternatives undertaken).*
*If the proposed CDM project activity includes several different facilities, technologies, outputs or services, alternative scenarios for each of them should be identified separately. Realistic combinations of these should be considered as possible alternative scenarios to the proposed project activity.*

This is discussed in the section B.4 and the result is **“Waste gas is released into the atmosphere after incineration and going for an onsite new coal based captive power plant”**

**Sub- Step 1b: Enforcement of applicable laws and regulations.**
*2. The alternative(s) shall be in compliance with all mandatory applicable legal and regulatory requirements, even if these laws and regulations have objectives other than GHG reductions, e.g. to mitigate local air pollution. (This sub-step does not consider national and local policies that do not have legally-binding status.).*
*3. If an alternative does not comply with all mandatory applicable legislation and regulations, then show that, based on an examination of current practice in the country or region in which the law or regulation applies, those applicable legal or regulatory requirements are systematically not enforced and that noncompliance with those requirements is widespread in the country. If this cannot be shown, then eliminate the alternative from further consideration;*
*4. If the proposed project activity is the only alternative amongst the ones considered by the project participants that is in compliance with mandatory regulations with which there is general compliance, then the proposed CDM project activity is not additional.*

The list of alternatives apart from the project activity which are in compliance with all mandatory applicable legal and regulatory requirements is as below

1. Waste gas is released to the atmosphere after incineration and on site or off site new renewable energy (Wind) based captive power plant.
2. Waste gas is released to the atmosphere after incineration and on site or off site fuel new fossil fuel (coal/HSD) based captive power plant.
3. Waste gas is released to the atmosphere after incineration and source the power from grid connected power plants.

Hence the proposed project activity is not the only alternative that is in compliance with all mandatory applicable legal and regulatory requirements.

*The project activity has crossed sub-step 1 of additionality demonstration, and hence this assessment has moved to the next step 2 investment analysis or step 3 barrier analysis.*

"***Proceed to Step 2 (Investment analysis) or Step 3 (Barrier analysis). (Project participants may also select to complete both steps 2 and 3.)"***

**Step 2. Investment analysis**

***Sub-step 2a. Determine appropriate analysis method***

**Option 1 as per Tool for the demonstration and assessment of additionality is Simple Cost Analysis.** It is applicable when CDM project activity produces no economic benefits other than CDM related income.

Option I, use of simple cost analysis, is not applicable as the project activity generates and uses the power generated for its own plant requirement and derives economic benefits.

SISCOL proposes to use **Option II – Investment Comparison analysis** as it derives economic benefits from the project activity by generation and use of electricity. Financial indicators like IRR/DSCR/NPV are not applicable as the objective of SISCOL is to procure power that is reliable to run its steel business. The levelized cost of electricity generation (INR/kwh) is the most suitable financial indicator for this decision making context.

***Sub-step 2b – Option II. Apply Investment Comparison analysis***

The Investment comparison analysis has been carried out by calculating the levelized cost of electricity generation (INR/kwh) for the alternatives:

- Coal based power generation.
- Utilization of waste heat/waste gas for power generation.

***Sub-step 2c. Calculation and comparison of financial indicators***

Case 1: At the time of conceptualization of the project activity.

At the time of conceptualization of the project activity the levelized cost calculation was carried out on the basis of following assumptions:

- The price of the waste gas is determined on the basis of coal price at 6500 kcal/kg (calorific value of the imported coal is 6500 kcal/kg) for equivalent Gcal based on guidance provided by Central Electricity Authority. The price formula accounts for the change in calorific value of coal. So JSW Power Limited, Unit-III does not have incentive for change in fuel configuration or maximization of the use of waste gas/waste heat in the fuel configuration.

Assumptions for Coal Based power plants

| Sr. No | Assumptions | Units | |
|---|---|---|---|
| 1 | Cost per MW | INR(in millions) /MW | 21.7 |
| 2 | Debt : Equity | % | 70:30 |
| 3 | PLF | % | 90 |
| 4 | Auxiliary Consumption | % | 10 |
| 5 | Rate of depreciation | % | 5.28 |
| 6 | O&M cost including insurance | % of capital cost | 2.5 |
| 7 | Heat Rate | kcal/kwh | 2830[17] |
| 8 | Cost of coal | INR/tonne of coal | 3000 |
| 9 | Discount factor for calculating levelized cost | % | 10 |

Assumptions for Waste Gas Based power plants

| Sr. No | Assumptions | Units | |
|---|---|---|---|
| 1 | Cost per MW | INR(in millions)/MW | 25.0 |
| 2 | Debt: Equity | % | 70:30 |
| 3 | PLF | % | 84 |
| 4 | Auxiliary Consumption | % | 8 |
| 5 | Rate of depreciation | % | 5.28 |
| 6 | O&M cost including insurance | % of capital cost | 2.5 |
| 7 | Heat Rate | kcal/kwh | 2830[18] |
| 8 | Cost of waste gas supplied by SISCOL to JPL 3 | INR/Gcal | 450 |
| 9 | Discount factor for calculating levelized cost | % | 10 |

The levelized unit cost of generation calculated based on above assumptions is

| Sr. No | Scenario | Levelized Cost of generation (INR/kwh) |
|---|---|---|
| 1 | Coal based captive power plant. | 2.46 |

[17] As per information provided by the equipment supplier. Document No. 1CYJ471960_013

[18] As per information provided by the equipment supplier. Document No. 1CYJ471960_013

| | | |
|---|---|---|
| 2 | Waste gas is used for power generation | 2.76 |

From the above table it can be concluded that coal based power plant is more lucrative option than the waste gas based power generation. However, on consideration of CDM revenue the waste gas based alternative becomes financially more attractive than coal based power plant.

**Case 2: After consideration of an additional investment of the coke oven gas based WHRB to account for likely failure in coke oven heat generation and its use**

As mentioned earlier, learning from the experience of the coke oven based power generation unit of JSW Steel Limited where in only 60 MW -70 MW became possible against expectation /plan of 100 MW, SISCOL decided to install another 30TPH WHRB so that the steel plant of SISCOL is not affected due to reduced power generation as a result of the risk and uncertainties involved in coke oven gas based power generation.

The levelized unit cost of generation calculated based on above assumptions is

| Sr. No | Scenario | Levelized Cost of generation (INR/kwh) |
|---|---|---|
| 1 | Coal based captive power plant. | 2.46 |
| 2 | Waste gas is used for power generation. | 2.86 |

From the above table it can be concluded that coal based power plant is more lucrative option than the waste gas based power generation. However, on consideration of CDM revenue the waste gas based alternative becomes financially more attractive than coal based power plant.

***Sub-step 2d. Sensitivity analysis (only applicable to options II and III):***
*Include a sensitivity analysis that shows whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. The investment analysis provides a valid argument in favour of additionality only if it consistently supports (for a realistic range of assumptions) the conclusion that the project activity is unlikely to be the most financially attractive (as per step 2c para 8a) or is unlikely to be financially attractive (as per step 2c para 8b).*

A sensitivity analysis was carried out to confirm the results of case 2. The sensitivity analysis has been carried out considering the following parameters:

| | | |
|---|---|---|
| 1 PLF | As variation in these parameters can impact the comparison of alternative investments. |
| 2 Heat Rate | |
| 3 Rate of Interest | These parameters also impact levelized cost estimates and also the parameters can change in the period of decision making. |

| Parameter | | Heat Rate (kcal/kwh) | Levelised cost for coal based power plant (INR/Kwh) | Levelised cost for waste gas based power plant ( INR/ Kwh) |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| PLF (% change) | - 5% | 2750 | 2.42 | 3.131 |
| | | 2830 | 2.486 | 3.186 |
| | | 2900 | 2.537 | 3.23 |
| | | | | |
| | -3% | 2750 | 2.419 | 2.995 |
| | | 2830 | 2.476 | 3.051 |
| | | 2900 | 2.527 | 3.099 |
| | | | | |
| | 0% | 2750 | 2.404 | 2.803 |
| | | 2830 | 2.462 | 2.859 |
| | | 2900 | 2.512 | 2.907 |
| | | | | |
| | 3% | 2750 | 2.391 | 2.625 |
| | | 2830 | 2.448 | 2.68 |
| | | 2900 | 2.499 | 2.728 |
| | | | | |
| | 5% | 2750 | 2.382 | 2.512 |
| | | 2830 | 2.44 | 2.568 |
| | | 2900 | 2.49 | 2.616 |

| Parameter | | Interest rate (% change) | Levelised cost for coal based power plant (INR/Kwh) | Levelised cost for waste gas based power plant ( INR/ Kwh) |
|---|---|---|---|---|
| PLF (% change) | - 5% | -1 | 2.471 | 3.164 |
| | | 0 | 2.486 | 3.186 |
| | | +1 | 2.50 | 3.209 |
| | | | | |
| | -3% | -1 | 2.461 | 3.028 |
| | | 0 | 2.476 | 3.051 |
| | | +1 | 2.49 | 3.073 |
| | | | | |
| | 0% | -1 | 2.447 | 2.837 |
| | | 0 | 2.462 | 2.859 |
| | | +1 | 2.477 | 2.88 |
| | | | | |

| | | | | |
|---|---|---|---|---|
| | 3% | -1 | 2.434 | 2.659 |
| | | 0 | 2.448 | 2.68 |
| | | +1 | 2.463 | 2.701 |
| | | | | |
| | 5% | -1 | 2.426 | 2.547 |
| | | 0 | 2.44 | 2.568 |
| | | +1 | 2.454 | 2.588 |

From the above sensitivity analysis it can be clearly seen that from all the plausible scenarios coal based power generation is financially more lucrative option than waste gas based power generation. But considering the CDM revenue in mind and its concern for environment, SISCOL decided to have a waste gas/waste heat based power plant instead of coal based power plant.

**Step 3. Barrier analysis**

Though it is not mandatory to conduct Steps 2 and 3, we propose to emphasize the technological barrier this project activity faces.

**Sub-step 3a. Identify barriers that would prevent the implementation of type of the proposed project activity:**

The project activity will utilize the available heat of the flue gases coming out of the Coke Oven plant and the waste gas coming out of Blast Furnace of SISCOL to generate electricity. The power plant has been designed with waste gas/waste heat as the only fuel source with no provision for supplementing with any other fuel to counter the potential risk of coke oven gases short fall. The production of coke oven gas is inherently uncertain as described below

- Non-availability of coking coal & non-coking coal for proper blending.
- Time to time the refractories of coke oven batteries may under go repair/replacement after its life and frequent repair work in the flue duct refractories.
- The coal handling equipments like hammer mill, screen, conveyor belt, coke plant-conveyor, screens & coke oven process equipments like stamping machine, pushing car, quenching car are highly maintenance-oriented equipments. Practically, down time of this equipment normally on the higher side.
- Lifting Blend control of coal also gets affected in monsoon, this in turn affects coking cycle.

Accordingly the technology barriers to the project activity are:

- The waste heat available in coke oven gas is utilised for producing steam in waste heat recovery boilers, utilising this type waste heat itself is a new technology and did not have any proven base.
- There are 3 coke oven batteries and each battery is having a dedicated WHRB and one BG gas fired boiler to produce steam. Also there is a coal fired AFBC boiler. Each WHRB and BF gas boiler will generate steam based on the availability of waste heat in the coke oven gas and calorific value of BF gas respectively. Mixing of steam from the two WHRB's, BF gas boiler along with AFBC boiler and feeding the turbines through a

common steam header is very difficult and needs highly skilled personnel as these may affect the safety as well as efficiency of running the turbine.

- Loss of generation due to under utilisation of power plant utilities can be caused by uncertainties in quantity of hot gas generation, variation in volatile matter in coking coal, variation in production rate, variation in time needed for making quality coke, draft limitations etc.(This is accounted in the financial analysis at Step 2)
- Power generation capacity may get reduced, due to uncertainty in reaching coke generation capacity (0.4 Million TPA), there by failing in full utilization of power plant capacity. (This is accounted in the financial analysis at Step 2).

These barriers associated with power generation from such waste heat recovery/waste gas system has in fact prevented and delayed the investment decision.However, in spite of all the aforementioned barriers SISCOL management has taken on board the recommendation for the project activity only after consideration of CDM benefits. SISCOL is shouldering the additional fund cost by showing confidence in the Kyoto Protocol/CDM system and the CDM benefits are envisaged to reduce the risks associated with the project activity.

**Step 4. Common practice analysis**

**Sub-step 4a. Analyze other activities similar to the proposed project activity:**

The proposed project activity is one of the first few power plants in India that will utilize both COFG from a non-recovery coke oven plant along with BFG for generation of power. At the time of conceptualization of this project activity there was no plant operational in India with similar technology.
The table below provides the information on date of commissioning of other similar project activities in India.

| Organization | Installed capacity | Date of Commissioning |
|---|---|---|
| JSPL, Raigarh | 60 MW | June 06 |
| Lanco Industries, Kalahasti | 25 MW | Proposed to be commissioned by Dec 07 |
| Sesa Goa | 25 MW | March 2008 (proposed date) |
| Hooghly Met coke | 120 MW | June 08 (proposed date) |
| Neelanchal Nigam Ispat Limted | 28 MW | Jan 2007 |

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

All the above projects are CDM project activities.

| Organization | CDM Project Cycle Status |
|---|---|
| JSPL, Raigarh | Registered |
| Lanco Industries, Kalahasti | Registered |
| Sesa Goa | Registered |

| | |
|---|---|
| Hooghly Met coke | At Validation |
| Neelanchal Nigam Ispat Limted | At Validation |

The above argument justifies that the Project activity is not a common practice.

Sub Step 4a and Sub-step 4b is satisfied.

Based on the above analysis, it is concluded that the project activity would not have been undertaken in the absence of CDM project benefits and without the CDM revenue SISCOL had no direct economic incentive to precede for the project activity. Therefore, the project activity is additional and the baseline scenario is "**Waste gas is released into the atmosphere after incineration and going for an onsite new coal based captive power plant"**

## B.6. Emission reductions:

### B.6.1. Explanation of methodological choices:

>>

*The baseline emissions for the year y shall be determined as follows:*

$$BE_y = BE_{En,y} + BE_{flst,y}$$

*where:*

*BEy are total baseline emissions during the year y in tons of CO2*

*BEEn,y are baseline emissions from energy generated by project activity during the year y in tons of CO2*

*BEflst,y Baseline emissions from generation of steam, if any, using fossil fuel, that would have been used for flaring the waste gas in absence of the project activity (tCO2e per year) calculated as per equation 1c. This is relevant for those project activities where in the baseline steam is used to flare the waste gas.*

*The calculation of baseline emissions (BEEn,y ) depends on the identified baseline scenario.*

***Baseline emissions for Scenario 1***

*As per ACM 0012, Scenario 1 represents the situation where the electricity is obtained from a specific existing power plant or from the grid and heat from a fossil fuel based element process (e.g. steam boiler, hot water generator, hot air generator, hot oil generator).*

***NOTE:*** *If the project activity is either generation of electricity only or generation of heat only, then one of the two sub-sections below shall be used for estimating baseline, depending on the type of energy generated by the project activity. Further, in case project activity is use of waste pressure to generate electricity then only section a) below is used.*

$$BE_{En,y} = BE_{Elec,y} + BE_{Ther,y}$$

*BEElec,y are baseline emissions from electricity during the year y in tons of CO2*

*BETher,y are baseline emissions from thermal energy (due to heat generation by element process) during the year y in tons of CO2*

***a) Baseline emissions from electricity (BEelectricity,y) that is displaced by the project activity:***

$$BE_{Elec,y} = f_{cap} * f_{wg} * \sum_{j}\sum_{i}((EG_{i,j,y} * EF_{Elec,i,j,y})$$

*Where:*
*BEelec,y are baseline emissions due to displacement of electricity during the year y in tons of CO2.*
*EGi,j,y is the quantity of electricity supplied to the recipient j by generator, which in the absence of the project activity would have been sourced from ith source (i can be either grid or identified source) during the year y in MWh, and*
*EFelec,i,j,y is the CO2 emission factor for the electricity source i (i=gr (grid) or i=is (identified source)), displaced due to the project activity, during the year y in tons CO2/MWh*
*fwg is the Fraction of total electricity generated by the project activity using waste gas. The steam used for generation of the electricity is produced in dedicated boilers but supplied through common header, this factor is estimated using equation (1e) (situation 2) which is stated below.*

*If the baseline generation source is an identified existing/new plant, the CO2 emission factor shall be determined as follows:*

$$EF_{Elec,is,j,y} = \frac{EF_{CO2,is,j}}{\eta_{Plant,j}} \times 3.6 * 10^{-3}$$

*Where:*
*EFCO2,is,j is the CO2 emission factor per unit of energy of the fossil fuel used in the baseline generation source i in (tCO2 / TJ), obtained from reliable local or national data if available, otherwise, taken from the country specific IPCC default emission factors*
*ηPlant,j is the overall efficiency of the existing plant that would be used by jth recipient in the absence of the project activity.*

*Efficiency of the power plant (ηplant,j) shall be one of the following:*
*i) Assume a constant efficiency of the captive plant and determine the efficiency, as a conservative approach, for optimal operation conditions i.e. design fuel, optimal load, optimal oxygen content in flue gases, adequate fuel conditioning (temperature, viscosity, moisture, size/mesh etc), representative or favorable ambient conditions (ambient temperature and humidity); or*
*ii) Highest of the efficiency values provided by two or more manufacturers for power plants with specifications similar to that that would have been required to supply the recipient with electricity that it receives from the project activity; or*
*iii) Assume a captive power generation efficiency of 60% based on the net calorific values as a conservative approach; or*
*iv)Estimated from load v/s efficiency curve(s) established for equipment(s) through measurement and described in Annex I. Follow international standards for estimation of efficiency of power plants.*

**The baseline scenario identified for this project activity in the above section B.4 is 'Waste gas is released into the atmosphere after incineration and going for an onsite new coal based captive power plant'. SISCOL along with a waste gas/waste heat based power generation project had also installed an identical capacity coal based power plant. Hence out of option (i), (ii) and (iii), the option (ii) was chosen as SISCOL had all the required specifications for an identical capacity coal based power plants and also in contact with some coal based power plant suppliers.**

***The overall plant efficiency have been taken as 30.4% (considering Turbine design heat rate of 2348 kcal/kwh[19] and 83% design boiler efficiency[20]) as per the information provided by the manufacturer.***

Hence $EFelec,i,j,y = \frac{25.8*44/12*3.6*10^{-3}}{30.4\%}$

$= 1.12\ tCO2/MWh$

***Calculation of the energy generated (electricity and/or steam) in units supplied by waste gas/heat and other fuels***

The calculation of the energy generated (electricity and/or steam) in units supplied by waste gas/heat and other fuels has been done taking into consideration situation 2 as described in ACM 0012

***Situation 2 (As per ACM 0012)***
*An alternative method that could be used when it is not possible to measure the net calorific value of the waste gas/heat, and steam generated with different fuels in dedicated boilers are fed to turbine/s through common steam header takes into account that the relative share of the total generation from waste gas is calculated by considering the total steam produced and the amount of steam generated from each boiler. The fraction of energy produced by the waste gas in project activity is calculated as follows:*

$$f_{WG} = \frac{ST_{whr,y}}{ST_{whr,y} + ST_{other,y}}$$

*Where:*
*ST whr y, Energy content of the steam generated in waste heat recovery boiler fed to turbine via common steam header*
*ST other y,Energy content of steam generated in other boilers fed to turbine via common steam header*

[19] As per the technical information provided by the equipment supplier. Document no : 1CYJ471960_013

[20] As per the technical specification provided by FICHTNER Consulting Engineers (India) Pvt. Ltd. Document no : 6244-ME-SPC-100-002

As mentioned earlier the total power generation capacity of the steam that will be generated in coke oven gas/blast furnace gas boilers considered for this project activity is 30 MW and that of coal is 30 MW. As mentioned earlier, SISCOL has lately decided to put up another 30TPH coke oven flue gas based WHRB to cover up for the reduced steam production due to the uncertainity factors involved in coke oven based power generation. But there is also a probability wherein the coke oven gas based power generation may work as per the earlier expectations. Under such cases the excess steam generated from coke oven gas based WHRB will replace the steam required from coal based boilers so that the total power generation is maintained in the required 60MW range. Hence in an ideal condition:

$ST\ whr\ y = ST_{coke\ 1} + ST_{coke\ 2} + ST_{coke\ 3} + ST_{BF}$

Where,

$ST_{coke\ 1}$ = Energy content of steam generated in WHRB 1 (feed – coke oven gas) in kcal/kg
$ST_{coke\ 2}$ = Energy content of steam generated in WHRB 2 (feed – coke oven gas) in kcal/Kg
$ST_{coke\ 3}$ = Energy content of steam generated in WHRB 3 (feed – coke oven gas) in kcal/Kg
$ST_{BF}$ = Energy content of steam generated in BF gas fired boiler (kcal/kg)

The table below provides the information on the total steam generation capacity of various waste gas/waste heat utilizing equipments, as per manufacturer's information.

| Equipment | Steam production Capacity (TPH) | | Energy Content of Steam (kcal) |
|---|---|---|---|
| WHRB 1 | 45 | $ST_{coke\ 1}$ | 155025000 |
| WHRB 2 | 45 | $ST_{coke\ 2}$ | 155025000 |
| WHRB 3 ( planned activity which will replace coal based steam ) | 30 | $ST_{coke\ 3}$ | 103350000 |
| BF gas fired boiler | 32 | $ST_B$ | 110240000 |
| **Total** | **152** | ***ST whr y*** | **523640000** |
| AFBC boiler (based on coal) | 127 | *ST other y* | 437515000 |
| **Total Power produced – 60MW** | **279** | | **961155000** |

Hence in an ideal condition,

$$f_{WG} = \frac{ST_{whr,y}}{ST_{whr,y} + ST_{other,y}}$$

$$= \frac{523640000}{523640000 + 437515000}$$

**$f_{wg}$ = 0.55**

***Capping of baseline emissions as per ACM 0012***

*As an introduction of element of conservativeness, this methodology requires that baseline emissions should be capped irrespective of planned/ unplanned or actual increase in output of plant, change in operational parameters and practices, change in fuels type and quantity resulting into increase in waste gas generation. In case of planned expansion a separate CDM project should be registered for additional capacity. The cap can be estimated using the two methods described below. Project proponents shall use method 1 to estimate the cap if data is available. In case of project activities using waste pressure to generate electricity or is implemented in a new facility, method 2 shall be used.*

***Method-2:*** *The manufacturer's data for the industrial facility shall be used to estimate the amount of waste gas/heat/pressure the industrial facility generates per unit of product generated by the process that generates waste gas/heat/pressure (either product of departmental process or product of entire plant, whichever is more justifiable and accurate). In case any modification is carried out by project proponent or in case the manufacturer's data is not available for an assessment should be carried out by independent qualified/certified external process experts such as a chartered engineer on a conservative quantity of waste gas generated by plant per unit of product manufactured by the process generating waste gas/heat/pressure. The value arrived based on above sources of data, shall be used to estimate the baseline cap (fcap). The documentation of such assessment shall be verified by the validating DOE.*
*The basis for using the capped value, (including manufacturer's design document/letter and the expert's analysis) should be provided to DoE during validation.*
*Under this method, following equations should be used to estimate fcap.*

$$f_{cap} = \frac{Q_{WG,BL}}{Q_{WG,y}}$$

$$Q_{WG,BL} = Q_{BL,product} \times q_{wg,product}$$

*Where:*
$Q_{WG,\ BL}$ *Quantity of waste gas generated prior to the start of the project activity estimated using equation 1f-1. (Nm3)*
$Q_{\ BL\ product\ ,}$ *Production by process that most logically relates to waste gas generation in baseline. This is estimated based on 3 years average prior to start of project activity.*
$q_{\ wg,\ product}$ *Amount of waste gas/heat/pressure the industrial facility generates per unit of product generated by the process that generates waste gas/heat/pressure.*

As per manufacturer's specification:

Quantity of coke oven waste gas $Q_{WG,BL\ coke}$ = $Q_{BL,coke}$ * , q wg, coke
= 3903 Nm3/Tonne * 62.31 MT coke production
= **243227 Nm3/hr**

Total Blast furnace gas production at SISCOL = $Q_{BL,hot\ metal}$ * , $q_{wg,hot\ metal}$
= 73.35 MT/hr of hot metal * 2045 Nm3/hr
= **150,000 Nm3/hr**

Quantity of Blast Furnace gas used for power generation after in house consumption
$Q_{WG,BL\ hot\ metal}$ = **36,000 Nm3/hr**

Total Quantity of waste gas being used for power generation (BF gas + Coke oven gas) = **279227 Nm3/hr.**

**The value of fcap will be equal to 1 as the project is a new installed facility in the planned expansion of the manufacturing unit.**

***Project Emissions***

*Project Emissions include emissions due to combustion of auxiliary fuel to supplement waste gas and electricity emissions due to consumption of electricity for cleaning of gas before being used for generation of heat/energy/electricity.*

$$PE_y = PE_{AF,y} + PE_{EL,y}$$

*Where:*
*PEy Project emissions due to project activity.*
*PE AF y, Project activity emissions from on-site consumption of fossil fuels by the cogeneration plant(s), in case they are used as supplementary fuels, due to non-availability of waste gas to the project activity or due to any other reason.*
*PE EL y, Project activity emissions from on-site consumption of electricity for gas cleaning equipment.*

***Project emissions due to auxiliary fossil fuel***

*These emissions are calculated by multiplying the quantity of fossil fuels (FFi,y) used by the recipient plant(s) with the CO2 emission factor of the fuel type i (EFCO2,i), as follows:*

$$PE_{AF,y} = \sum FF_{i,y} \cdot NCV_i \cdot EF_{CO2,i} \cdot$$

*Where:*
*$PE_{AF,y}$ are the emissions from the project activity in year y due to combustion of auxiliary fuel in tonnes of CO2*

*FFi,y is the quantity of fossil fuel type i combusted to supplement waste gas in the project activity during the year y, in energy or mass units*
*NCVi is the net calorific value of the fossil fuel type i combusted as supplementary fuel, in TJ per unit of energy or mass units, obtained from reliable local or national data, if available, otherwise taken from the country specific IPCC default factors*

*EFCO2,i is the CO2 emission factor per unit of energy or mass of the fuel type i in tons CO2 obtained from reliable local or national data, if available, otherwise taken from the country specific IPCC default factors*

As for the project activity no auxiliary fuel firing will be required, the project emissions are considered zero.

### B.6.2. Data and parameters that are available at validation:

| **Data / Parameter:** | $n_{BL}$ |
|---|---|
| Data unit: | % |
| Description: | Baseline efficiency of the captive power plant |
| Source of data used: | As per the information provided by equipment supplier |
| Value applied: | 30.4% |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The efficiency of baseline captive power plant has be calculated considering turbine design heat rate of 2348 kcal/kwh[21] and 83% design boiler efficiency[22] |
| Any comment: | This value will remain constant throughout crediting period |

| **Data / Parameter:** | $EF_{elec,i,j,y}$ |
|---|---|
| Data unit: | tCO2/Mwh |
| Description: | CO2 emission factor for the electricity source i (i=gr (grid) or i=is (identified source)) , displaced due to the project activity, during the year *y* |
| Source of data used: | Calculated as per supplier's information |
| Value applied: | 1.12 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The emission factor of the baseline electric source will be calculated yearly based on ACM 0012 by considering the following parameters<br>1) Emission factor of the fuel used in the baseline scenario.<br>2) Efficiency of captive power plant considered in the baseline scenario. |
| Any comment: | This value will remain constant throughout crediting period |

| **Data / Parameter:** | $Q_{WG,BL, coke}$ |
|---|---|
| Data unit: | m3/hr |

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[21] As per the technical information provided by the equipment supplier. Document no : 1CYJ471960_013

[22] As per the technical specification provided by FICHTNER Consulting Engineers (India) Pvt. Ltd. Document no : 6244-ME-SPC-100-002

| | |
|---|---|
| Description: | Estimated quantity of flue gas that will be generated from coke oven. |
| Source of data used: | Manufacturer's specifications |
| Value applied: | 243227 m3/hr |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Estimated based on information provided by the technology supplier on the waste gas generation per unit of product and volume or quantity of production. |
| Any comment: | |

| **Data / Parameter:** | $Q_{WG,BL\ hot\ metal}$ |
|---|---|
| Data unit: | Nm3/hr |
| Description: | Estimated quantity of waste gas available for power generation from Blast Furnace during production of hot metal, after in house consumption. |
| Source of data used: | Manufacturer's specifications |
| Value applied: | 36,000 Nm3/hr |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Estimated based on information provided by the technology supplier on the waste gas generation per unit of product and volume or quantity of production. |
| Any comment: | - |

| **Data / Parameter:** | $Q_{BL,coke},$ |
|---|---|
| Data unit: | Tons/hr |
| Description: | Quantity of coke produced per hour |
| Source of data used: | Manufacturer's specifications |
| Value applied: | 62.31 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Estimated based on information provided by the technology supplier on the quantity of production. |
| Any comment: | - |

| **Data / Parameter:** | $Q_{BL,\ hot\ metal}$ |
|---|---|
| Data unit: | Tons/hr |
| Description: | Quantity of hot metal produced per hour |
| Source of data used: | Manufacturer's specifications |
| Value applied: | 73.35 |
| Justification of the choice of data or description of measurement methods | Estimated based on information provided by the technology supplier on the quantity of production. |

| | |
|---|---|
| and procedures actually applied : | |
| Any comment: | |

| Data / Parameter: | $q_{wg,coke}$ |
|---|---|
| Data unit: | m3/Ton |
| Description: | Specific waste gas production per unit of coke generated as per manufacturer's or external expert's data. |
| Source of data used: | manufacturer specification's |
| Value applied: | 3903 Nm3/tonne of coke production |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Information provided by the technology supplier. |
| Any comment: | |

| Data / Parameter: | $q_{wg, hot\ metal}$ |
|---|---|
| Data unit: | m3/Ton |
| Description: | Specific waste gas production from Blast Furnace per unit of hot metal produced as per manufacturer's or external expert's data. |
| Source of data used: | manufacturer specification's |
| Value applied: | 2045 Nm3/tonne of hot metal production |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Information provided by the technology supplier |
| Any comment: | |

**B.6.3 Ex-ante calculation of emission reductions:**

>>

| Sr. No | | Description | Unit | |
|---|---|---|---|---|
| 1 | *EGi,j,y* | Quantity of electricity supplied to the recipient *j* by generator, which in the absence of the project activity would have been sourced from *i*th source (*i* can be either grid or identified source) during the year *y* in MWh | MWh/yr | 473,000 |

| | | | | |
|---|---|---|---|---|
| 2 | *EFelec,i,j,y* | CO2 emission factor for the electricity source i (i=gr (grid) or i=is (identified source)), displaced due to the project activity, during the year *y* | tCO2/MWh | 1.12 |
| 3 | fwg | Fraction of total electricity generated by the project activity using waste gas | | 55% |
| 4 | fcap | Energy that would have been produced in project year y using waste gas/heat generated in base year expressed as a fraction of total energy produced using waste gas in year y. | | 1 |
| 5 | ηPlant,j | Overall efficiency of the plant that would be used by jth recipient in the absence of the project activity. | % | 30.4% |
| 6 | EFCO2,is,j | CO2 emission factor per unit of energy of the fossil fuel used in the baseline generation source i | tCO2/TJ | 94.6 |
| 7 | BEElec,y | Baseline Emission from electricity generation | tCO2/yr | 291368 |
| 8 | BETher,y | Baseline emissions from thermal energy | tCO2/yr | 0 |
| | **BE,y** | **Total Baseline Emissions** | **tCO2/yr** | **291368** |

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

>>

| **Year** | **Estimation of Project Activity emissions (tonnes of CO2e)** | **Estimation of baseline emissions (tonnes of CO2e)** | **Estimation of leakage (tonnes of CO2e)** | **Estimation of overall emission reductions (tonnes of CO2e)** |
|---|---|---|---|---|
| | | | | |
| Year 1* | 0 | 291368 | 0 | 291368 |
| Year 2 | 0 | 291368 | 0 | 291368 |
| Year 3 | 0 | 291368 | 0 | 291368 |
| Year 4 | 0 | 291368 | 0 | 291368 |
| Year 5 | 0 | 291368 | 0 | 291368 |
| Year 6 | 0 | 291368 | 0 | 291368 |
| Year 7 | 0 | 291368 | 0 | 291368 |
| Year 8 | 0 | 291368 | 0 | 291368 |
| Year 9 | 0 | 291368 | 0 | 291368 |
| Year 10 | 0 | 291368 | 0 | 291368 |
| **Total (tonnes of CO2e)** | **0** | 291368 | **0** | 2913680 |

*** Year 1 starts from the date of registration**

### B.7 Application of the monitoring methodology and description of the monitoring

**plan:**

### B.7.1 Data and parameters monitored:

| **Data / Parameter:** | $EG_{i,j,y}$ |
|---|---|
| Data unit: | MWh |
| Description: | Quantity of electricity supplied to the recipient *j* by generator, which in the absence of the project activity would have sourced from *i*th source (*i* can be either grid or identified source) during the year *y* in MWh. |
| Source of data to be used: | Log books |
| Value of data | 473,000 |
| Description of measurement methods and procedures to be applied: | The electronic meter is provided at the outlet of turbine. 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. |
| QA/QC procedures to be applied: | The accuracy level of all the electricity meters under the control of the project participant is of accuracy class 0.2. The measurement and calibration procedure shall be done as specified in the CEA (Government/Regulatory authority) regulations. The measurement will be done on-line and the data is recorded in the control system. Thus, the uncertainty level of this data is low |
| Any comment: | No additional QA/QC procedures will be applied |

| **Data / Parameter:** | $EF_{CO2,I}$ |
|---|---|
| Data unit: | Tonnes $CO_2$ / TJ |
| Description: | $CO_2$ emission factor per tonne of fuel (coal) used |
| Source of data to be used: | IPCC Default Value |
| Value of data | 94.6 |
| Description of measurement methods and procedures to be applied: | As per IPCC, the emission factor for coal is 25.8 tC/TJ |
| QA/QC procedures to be applied: | No QA/QC procedure is required |
| Any comment: | |

| **Data / Parameter:** | $ST_{coke\ 1}$ |
|---|---|
| Data unit: | kCal/kg |
| Description: | Energy content of steam generated in WHR Boiler 1 (based on waste gas generated at coke oven ) fed to turbine via common steam header |

| | |
|---|---|
| Source of data to be used: | Steam tables |
| Value of data | 823 |
| Description of measurement methods and procedures to be applied: | The electronic meter is provided at the outlet of WHRB to measure the temperature and pressure of steam. 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. |
| QA/QC procedures to be applied: | The plant is having internal QA/QC procedure and the project team adheres to the same QA/QC procedures. |
| Any comment: | The uncertainty involved is very low |

| **Data / Parameter:** | $ST_{coke\ 2}$ |
|---|---|
| Data unit: | kCal/kg |
| Description: | Energy content of steam generated in WHR Boiler 2 ( based on waste gas generated at coke oven ) fed to turbine via common steam header |
| Source of data to be used: | Steam tables |
| Value of data | 823 |
| Description of measurement methods and procedures to be applied: | The electronic meter is provided at the outlet of WHRB to measure the temperature and pressure of steam. 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. |
| QA/QC procedures to be applied: | The plant is having internal QA/QC procedure and the project team adheres to the same QA/QC procedures. |
| Any comment: | The uncertainty involved is very low |

| **Data / Parameter:** | $ST_{coke\ 3}$ |
|---|---|
| Data unit: | kCal/kg |
| Description: | Energy content of steam generated in WHR Boiler 3 ( based on waste gas generated at coke oven ) fed to turbine via common steam header |
| Source of data to be used: | Steam tables |
| Value of data | 823 |
| Description of measurement methods and procedures to be applied: | The electronic meter is provided at the outlet of WHRB to measure the temperature and pressure of steam. 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. |
| QA/QC procedures to be applied: | The plant is having internal QA/QC procedure and the project team adheres to the same QA/QC procedures. |
| Any comment: | The uncertainty involved is very low |

| **Data / Parameter:** | $ST_{BF}$ |
|---|---|
| Data unit: | kCal/kg |
| Description: | Energy content of steam generated in WHR Boiler ( based on waste gas from |

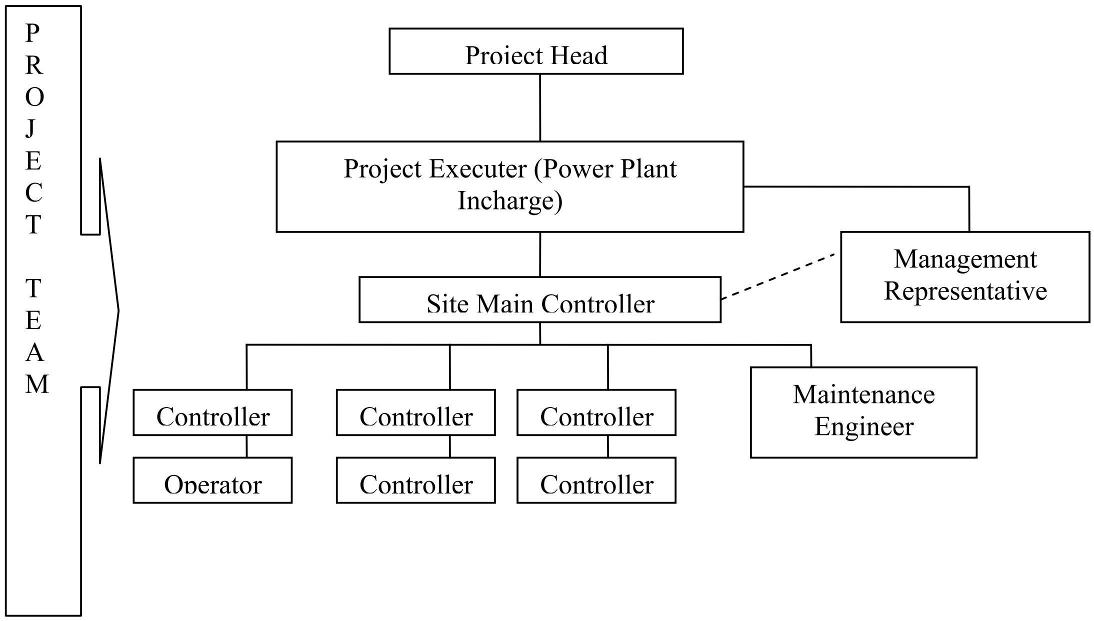
| | |
|---|---|
| | Blast furnace, after in house consumption) fed to turbine via common steam header |
| Source of data to be used: | Steam tables |
| Value of data | 823 |
| Description of measurement methods and procedures to be applied: | The electronic meter is provided at the outlet of BF gas fired boiler to measure the temperature and pressure of steam. 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. |
| QA/QC procedures to be applied: | The plant is having internal QA/QC procedure and the project team adheres to the same QA/QC procedures. |
| Any comment: | The uncertainty involved is very low |

**B.7.2 Description of the monitoring plan:**

>>

The project is operated and managed by SISCOL who is the project proponent. Managing Director (MD) has constituted the CDM project team, which is responsible for the project activity. The team is responsible for monitoring, verification and recording of the data. SISCOL has well diversified procedure for collection of data and analysis of data at different levels and for subsequent corrective actions as when required in line with these policies. The site main controller is responsible for checking the information consistency. The power plant operator is responsible for managing the computer system, which are utilised to store the data. The power plant operator collects the data and stored the data in the computer system. The controller checks the accuracy of the data and verifies the storage of data. The controller and maintenance engineer report to the site main controller who reports to Project Executor and Controller. Project Executor report to the Project Head.

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




**<u>Monitor and verify the CDM project and data</u>**.

List of Key person:

Project Head : Joint Managing Director & CEO
Project Executor and Controller : Chief General Manager (Engg & Proj)
Site Main Controller : Senior Manager
Controller : Manager
: Dy.Manager (Environment)

| Designation | Responsibility |
|---|---|
| Project Head: | • Registration |
| Project Executer and Controller: | Project Execution and Operation. Control of documents. |
| Site Main Controller | Monitoring & Verification of data (once in a day), Operation |
| Controller | Monitoring of data collection Checking of data, Operation, Power generation, Data collection, Checking data accuracy , Data recording cross checking |
| Maintenance Engineer | Mechanical Maintenance, Energy Input meter monitoring & |

| | |
|---|---|
| | Maintenance , Energy output meters, WHRB maintenance, BFG boiler maintenance, TG 1, ESP, Pump House |
| Operator | Data collection, data recording, data storage |

**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 completing the final draft of this baseline section *(DD/MM/YYYY)*: 05/05/2007**
**Name of person/entity determining the baseline:** SISCOL and CantorCO2e India Private Limited

## 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:

>>
26/11/2004

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

>>
30 years

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

#### C.2.1. Renewable crediting period

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

>>

##### C.2.1.2. Length of the first crediting period:

>>

#### C.2.2. Fixed crediting period:

##### C.2.2.1. Starting date:

>>
11/10/2007

##### C.2.2.2. Length:

>> 10 years

## SECTION D. Environmental impacts

>>

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

>>

The EIA for the project activity is carried out as mandated by the Environmental Protection Act 1986. In case of Thermal Power Plants, by a notification of 10 April 1997, Ministry of Environment and Forest (MoEF), Government of India (GoI) has delegated power to the State Governments for environmental clearances for some specific categories of plants. The environmental clearance for this project is guided by the above-mentioned notification and accordingly an Environmental Impact assessment has been conducted. This project activity has received environmental clearance and the environmental impacts are not significant.

The overall environmental impact will not be significant and there will be transboundary impacts outside the project boundary due to this project as waste heat/waste gas used for the power generation. A summary of impacts is presented below:

Land use

There will be no change or disturbances in land use as the project activity is carried out inside the existing SISCOL complex. The project activity is an entirely waste free activity (no ash generation), as it is based on waste gas utilization for power generation.

Water quality

There will be no impact on water quality of local water source including the rivers.

Air quality

The project activity utilise waste heat and waste gas for power generation, which otherwise would have been let into atmosphere and flared respectively. Hence, there will no generation of any primary and secondary pollutants except NOx. The increase in air pollutants due to this project will be negligible as clean/cleaned gas used for power generation mainly Suspended Particulate Matter.

Socio economic Environment

There is an increase in the employment after the project activity in the plant and a number of people are being temporarily employed during the construction.

### 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:

>>

The environmental impacts are considered not significant by the host party. SISCOL has obtained clearance from Tamil Nadu State Pollution Control Board & Ministry of Environment and Forest (MoEF) to operate the power plant.

## SECTION E. Stakeholders' comments

>>

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

>>

The stakeholders for the project activity were identified at the outset by a team of SISCOL staff and the stakeholders were duly informed of the consultation meeting. In addition public notices were also issued for the local stakeholder consultation meeting. Participants representing various groups attended the meeting on 12th May 2007 at Panchayat Union Office, Mecheri Salem, Tamil Nadu, India.

- Local communities,
- NGOs,
- State government and governmental agencies,
- Employees,
- Contractors and
- Consultants/ advisors

The meeting agenda was as follows:
a) Welcome address to the representatives by Mr J Devakumar, Senior Manager, SISCOL
b) Election of a Chairperson for the meeting by the stakeholder group representatives from amongst themselves.
c) Introduction of the project by Mr K Kannan, Chief General Manager ,SISCOL on request from the Chair.
d) Open house discussion on the merits of the project with permission of the Chair.
e) Summation of the concerns expressed by the stakeholder groups and the commitments to address the concerns.
f) Preparation and circulation of draft Minutes of the Meeting and signing of the MOM.

### E.2. Summary of the comments received:

>>

| Stakeholder Concerns /Questions / Comments | Answer / Outcome |
|---|---|
| Mr Kasi Viswanathan, Chairman, Mecheri Panchayat Union<br>*He wished the implementation of CDM at SISCOL and requested employment opportunities for youth in the village.* | The company is doing the best to the local employment. We will make healthy organization first and still do more to the public. We will give employment to the left out eligible candidates of land owners who had given the land. |
| Mr Raja – Ex-Chairman – Mecheri Panchayat Union | Presently about 10000 people are |

| | |
|---|---|
| He appreciated the following benefits received from SISCOL:-<br>• SISCOL management had arranged for the effective (Environment) management of handling solid wastes at Yervadi area, which is generated from a process at the factory.<br>• Employment opportunities have been provided to many qualified people in the past.<br>**He put forth his request for the following:-**<br>• Helping farmers of the nearby villages to improve their standard of living<br>• Awarding small contract jobs to the local contractors for improving their standard of living | working in the expansion project. CDM is the fist step towards helping for the society development. |
| What is the method adopted for handling Blast Furnace gas with continuous pressure for further utilization? | In our process, the BF gas is used in the Re-heating Furnace, Sinter Plant, power plant etc. instead of flaring and venting out. We have Gas Holder to store BF gas that will act as buffer tank and give constant pressure to avoid sudden surging or pressure fluctuations. |
| Can the gases coming out of EOF and CCM used as like Blast Furnace gas? | The gases generated from EOF and CCM operations do not have required calorific value or CO or required heat value and hence it can not be used. The gases generated from EOF and CCM is cleaned through wet scrubbing fume extraction system and the dust content removed and cleaned gas let out to the atmosphere. |
| How the gas emission in Coke Oven Plant is handled? | *There is no harm to the life of human being out of Coke Oven gas. Temperature is varying from 900° C to 1050 ° C. Sensible heat is recovered from the gas through boilers and converted into electricity.*<br>SISCOL is following the norms fixed by the statutory authorities with regard to emission of gas and also pollution control measures. |
| How the waste gas in Sinter Plant is handled? | The waste gas being generated in Sinter Plant is cleaned through ESP System. |

| | |
|---|---|
| | The dust being removed and cleaned air let out to the atmosphere. |
| Whether the power generation started or yet to be started? | It was told in the presentation. The power generation is not yet started and it will be started in the month of August 2007. At present, gas extracted from various processes is used at Power Plant and Re-heating Furnace. etc. The proposed power generation will use the gas from the new Blast Furnace. |
| **Mr.Pon.Selvadurai, Ex.President, M.Kalipatti**<br>He appreciated the various benefits received from SISCOL to his panchayat during his period as president of M.Kalipatti and requested for local employment for local people. | |
| Mr P K Rajendran, Sr. Technical Operator – Utility Dept.<br><br>He wished Development of green belt around the region once the Project is fully functional. | |
| Mr.Anna Malai, Former Secretary (ADMK), Mecheri Union<br>*He requested employment opportunities for youth in the nearby village.* | The company is doing the best to the local employment. We will make healthy organization first and still do more to the public. We will give employment to the left out eligible candidates of land owners who had given land. |
| Mr Sadasivam, Councilor- District Panchayat, Mecheri.<br><br>He raised concerns on water usage. | He apprised that the water usage strictly follows norms which are laid down by the regulations |

The stakeholder viewed **M/s Southern Iron and Steel Company Limited** as a reputed company contributing to local socio economy. Overall there was unanimous agreement that the proposed project was a beneficial project from sustainability point of view. Specific concerns and questions and the answers are delineated in the table below.

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

>>

The measures described in the answers to the stakeholders as at E.2 are part of the Environmental Management Plan of SISCOL. The stakeholders viewed SISCOL as a reputed company contributing to local socio-economy. Overall there was unanimous agreement that the proposed project was a beneficial project from sustainability view-point

**Annex 1**

**CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

| | |
|---|---|
| Organization: | Southern Iron and Steel Company Limited |
| Street/P.O.Box: | Pottaneri & M.Kalipatti villages |
| Building: | Mecheri, Mettur Taluk |
| City: | Salem District, Pin code : 636 453 |
| State/Region: | Tamil Nadu |
| Postfix/ZIP: | |
| Country: | India |
| Telephone: | 0091 4298 278400, 401, 402 & 403 |
| FAX: | 0091 4298 278618 |
| E-Mail: | kkannan@siscolworks.com |
| URL: | |
| Represented by: | |
| Title: | Chief General Manager |
| Salutation: | Mr. |
| Last Name: | Kannan |
| Middle Name: | |
| First Name: | Krishnasamy |
| Department: | Engineering & Projects |
| Mobile: | 0091 9894670702 |
| Direct FAX: | 0091 4298 278512 |
| Direct tel: | 0091 4298 278400, 401, 402 & 403 |
| Personal E-Mail: | Kannan.krishnasamy@siscol.com |

## Annex 2

### INFORMATION REGARDING PUBLIC FUNDING

No funding from any Annex I party has been taken.

## Annex 3

## BASELINE INFORMATION

Please refer section B.1, B.3 and B.4

## Annex 4

## MONITORING INFORMATION

The monitoring plan has been prepared in accordance with ACM 0012.The project proponent has a well defined project management structure for monitoring the project activity. The monitoring plan is discussed in section B.7.2.

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