

**CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006**

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Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	<ul style="list-style-type: none">• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document.• As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	15 December 2006	<ul style="list-style-type: none">• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM

SECTION A. General description of small scale project activity

A.1 Title of the small scale project activity:

>> Energy efficiency improvement in power generation at Sajjan India Limited, Ankhleshwar, Gujarat;
Version 02, 19/02/2007

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

>> Sajjan India Limited (SIL) formed in 1983, has aimed at implementation of energy efficient technology for steam, chilled water and power production, at the company's modern manufacturing facility at Ankhleshwar, Gujarat, India. Sajjan India Limited (SIL) is into business of manufacturing of speciality chemicals.

The use of grid power (western grid) that is predominantly based on coal, and use of lignite onsite to produce steam, pushed the company to look for alternatives with efficient technologies based on cleaner fuel(s). The project activity has reduced the release of CO₂ emissions into the atmosphere and has enabled conservation of environment and natural resources such as lignite and oil.

Purpose

The basic objective of the project is to reduce energy consumption per unit of power, steam and refrigeration production through implementation of energy efficient technologies at SIL. The project utilizes natural gas (NG), a cleaner fuel, effectively through the use of highly efficient process of combined heat, power and refrigeration generation. The project replaces lignite based process steam and grid power operated compressor based chilled water generation. Further, the project paves way for NG based power generation substituting grid supplied electricity for onsite consumption.

The project was planned to be implemented in three phases. The first two phases are complete with installation of two 1 MW each capacity NG engine generator sets, complete with two waste heat recovery boilers and a vapour absorption machine (VAM). In the third phase, SIL has plans to implement one more 1 MW NG fired engine generator with a waste heat recovery boiler and a VAM for steam and chilled water generation respectively. Besides SIL is in the process of converting a coal fired boiler to 14.5 TPH capacities NG fired one. This third phase is expected to get over by March 2007. The annual demand or requirement of NG for the project is met through piped gas network by Gujarat Gas Company Limited (GGCL).

The details of phase wise implementation are given below:

Phase	Activity	Date
1	NG fired engine generator with waste heat recovery boiler and NG/FO fired boiler was commissioned.	November 2002
2	NG fired engine generator with waste heat recovery boiler and Jacket heat recovery VAM was commissioned	September 2005
3	NG fired engine generator with waste heat recovery boiler, Jacket heat recovery VAM and NG fired boiler will be commissioned.	March 2007 (Expected)

Project Activity's Contribution to Sustainable Development

Government of India has stipulated the following indicators for sustainable development in the interim approval guidelines for CDM projects – Social well being, Economic well being, Environmental well being, and Technological well being.

SIL believes that the project activity will contribute positively to the 'Sustainable Development of India'. The four pillars of sustainable development have been addressed as follows:

Socio-economic well-being:

The project activity has reduced the demand in power deficit grid.

The project activity helped to create business opportunity for local stakeholders such as suppliers, manufacturers, contractors etc.

There has been a reduction in fuel consumption thorough energy efficiency measures

SIL has employed local people during construction and operation at project site.

Environmental well-being:

The project activity uses clean fuel and efficient technology for power, steam and chilled water generation, which would, reduces green house emissions in to atmosphere, over project lifetime.

The project would contribute towards the reduction in (demand) use of lignite minimizing depletion or else increasing availability to other important processes.

Technological well-being:

The technology selected for the project activity is an efficient and friendly one. It includes 4 stroke, 20 cylinder water cooled engines, waste heat recovery steam boilers, jacket heat recovery heat exchangers and a vapour absorption machines.

The process is highly efficient (efficiency of 75-80%) as compared to of grid power generation efficiency (efficiency of 30-35%).

The area has good supply of NG and the success of the project at SIL will give a boost for other industries to replicate the highly efficient process in their manufacturing. .

A.3. Project participants:

>>

Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host)	Sajjan India Limited (Private Entity)	No

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

>>

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

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A.4.1.1. Host Party (ies):

India

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

Gujarat

A.4.1.3. City/Town/Community etc:

Ankleshwar

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

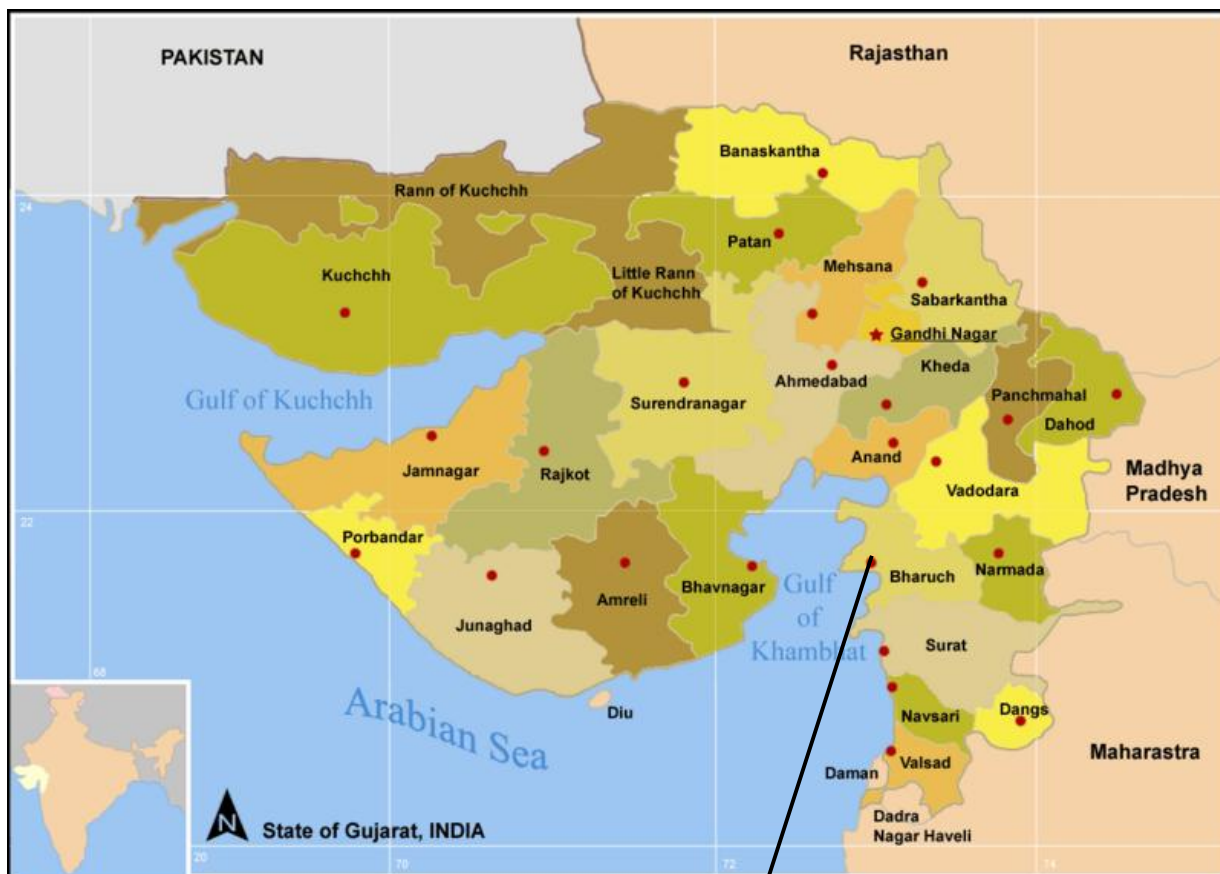
The project activity is located at Plot no. 6117-6119, Gujarat Industrial Development Corporation (G.I.D.C), Ankleshwar, Gujarat, India. The site is located in Industrial Township called G.I.D.C. which is the biggest industrial township in Asia. The location is selected considering various aspects like availability of natural gas supplies through out the year, infrastructure and availability of semi skilled and skilled labour. Ankleshwar is well connected by Indian national highway 8 (Mumbai to New Delhi) and by the western railway division of Indian railways. The nearest railway station, at Ankleshwar, and the nearest airport, at Vadodara, is located at a distance of 6 kilometres and 80 kilometres respectively from the SIL project site.

The geographical location of Ankleshwar is detailed in the maps (not to scale) below:



Map of India showing location of Gujarat

(Source:<http://www.mapsofindia.com/maps/india/india-political-map.gif>)



Map of Gujarat with location of Ankleshwar near Bharuch

21.38 N (Latitude) and 73.02 E (Longitude)

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

Type and Category of Project Activity

The project meets the applicability criteria of the small scale CDM project activity category, Type-II: energy efficiency improvement projects (D: Energy efficiency and fuel switching measures for industrial facilities) of the 'Indicative simplified baseline and monitoring methodologies for selected small CDM project activity categories'.

Main Category: Type II – Energy efficiency improvement project

Sub Category: D Energy efficiency and fuel switching measures for industrial facilities

As per the provisions of appendix B of simplified modalities and procedures for small scale CDM project activities (version 08, dated 23 December, 2006), Type II D “comprises any energy efficiency and fuel switching measure implemented at a single industrial facility. This category covers project activities aimed primarily at energy efficiency; a project activity that involves primarily fuel switching falls into category III.B.1 Examples include energy efficiency measures (such as efficient motors), fuel switching measures (such as switching from steam or compressed air to electricity) and efficiency measures for specific industrial processes (such as steel furnaces, paper drying, tobacco curing, etc.). The measures may replace, modify or retrofit existing facilities or be installed in a new facility. The aggregate energy savings of a single project may not exceed the equivalent of 60 GWhe per year. A total saving of 60 GWhe per year is equivalent to a maximal saving of 180 GWhth per year in fuel input.”

The project activity applicability:

1. The project activity comprises energy efficiency and fuel switch measure at single facility
2. The project activity replaces existing Lignite Fired Boiler
3. The aggregate thermal savings will be 18.055 GWh, which is below the limit of small scale project activity of this category.

The baseline and emission reduction calculations from the project would be based on paragraphs 3 and 4 of appendix B (Version 08, dated 23rd December 2006) and the monitoring methodology would be based on guidance provided in paragraph 6 and 7 of II D of the same appendix B.

Project activity with technology details

The technology employs Natural gas fired engine generator(s) coupled with an alternator to generate power. The engine(s) uses leanox method in which a mixture of gas and surplus of air minimizes emissions at the combustion stage. This intake air gas mixture is pressure charged by using exhaust gas turbocharger. The exhaust flue gases are used by waste heat recovery boiler(s) during phase 1 and 2 (also proposed in phase 3) to produce process steam. The excess heat is trapped by jacket heat recovery system(s) and is used to raise the temperature of feed water to already existing lignite fired boiler in phase 1 and operate a Vapor Absorption Machine (VAM) in phase 2 (also proposed in phase 3).

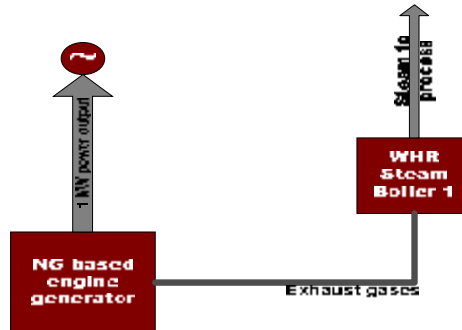
The technical specifications of additional equipments used in the project activity are as follows:

Technical Specifications:

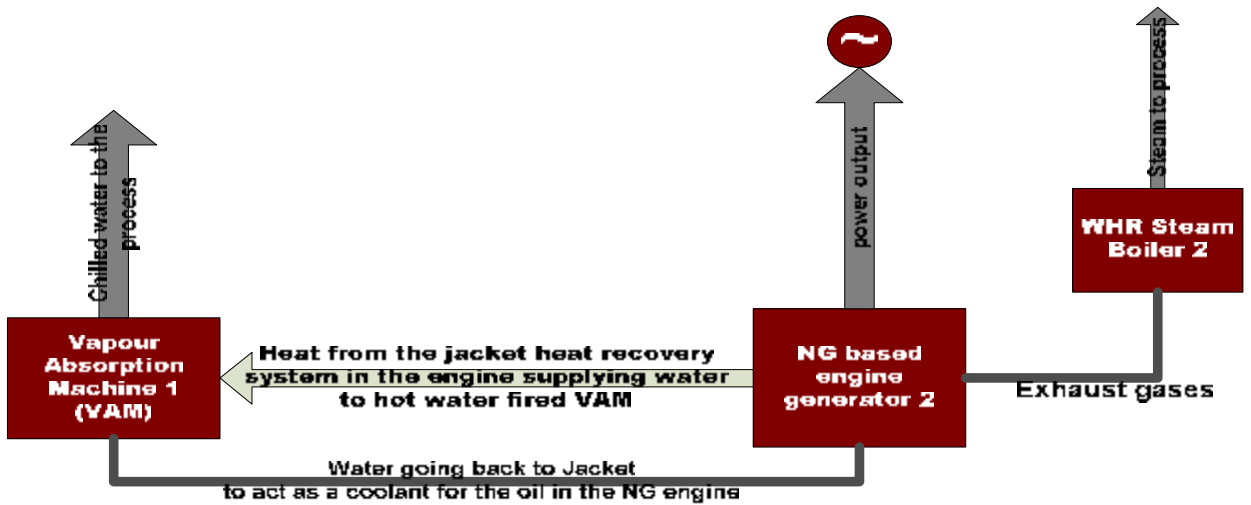
Sr. No.	Equipment	Specifications
1.	Natural gas fired engine generator 1	Engine - Jenbacher, Austria make, 1077 KW, model J320GS B05, Sr.no. 361981; Alternator: Stamford make, 1064 KW, model HC.I734F2-CG, Sr.no.0152526/01; Set: Jenbacher, 1048 KW, 1500 RPM, Sr.no. 3619231, year of Mfg: 2002.
2.	Natural gas fired engine generator 2 & 3	Engine – GE Jenbacher, Austria make, 1095 KW, model-J320GS C05, Sr.no. 4312401; Alternator: Stamford make, 1156 KW, model PE734C2, Sr.no.A05C376100; Set: GE Jenbacher, 1065 KW, 1500 RPM, and Sr.no. 4312411, year of Mfg: 2005.
3.	Waste heat recovery steam boiler 1	Exhaust gas flow – 5728 kg/hr @ 500 deg C, heating surface 206 M2, IBR, Class-1, working pressure- 10.55 kg/cm ² ,
4.	Waste heat Recovery steam Boiler 2 & 3	Exhaust gas flow – 5680 kg/hr @ 427 deg C, heating surface 206 M2, IBR, Class-1, working pressure- 10.55 kg/cm ²
5.	Jacket heat recovery Vapour absorption machine 1 & 2	107 TR capacity @ 5 deg C, Hot water temp in/out- 90/81 flow 50 m ³ /hr.
6.	Natural gas fired boiler	14.5 Ton Boiler, 33 bar, 350deg C
7	FO/NG boiler	6 Tons Boiler, 17 Bar, 184.15 deg C

The block diagrams below represent the power generation and heat recovery system as explained.

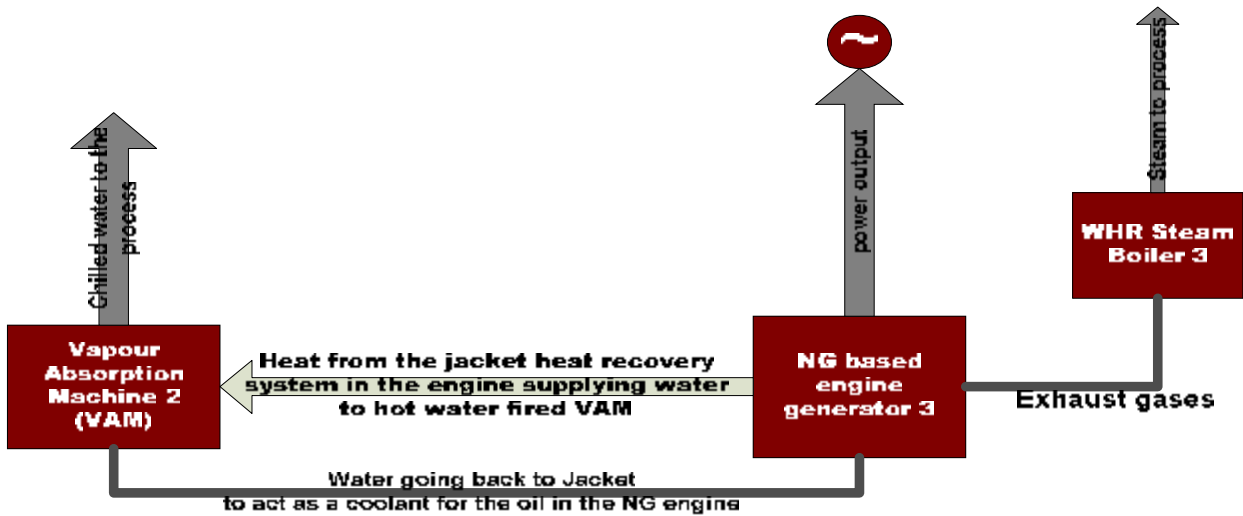
Phase 1-Implemented



Phase 2- Implemented



Phase 3- Proposed



A.4.3 Estimated amount of emission reductions over the chosen crediting period:

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Years	Annual estimation of emission reductions* (in tonnes of CO ₂ e)
2007-08	25732
2008-09	25732
2009-10	25732
2010-11	25732
2011-12	25732
2012-13	25732
2013-14	25732
2014-15	25732
2015-16	25732
2016-17	25732
Total estimated reductions (tonnes of CO₂ e)	257320
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO₂ e)	25732

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

>> The project has not received any public funding from Annex I countries and Official Development Assistance (ODA). The project is a unilateral project.

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

>> According to appendix C of simplified modalities and procedures for small scale CDM project activities, '*debundling*' is defined as the fragmentation of a large project activity into smaller parts. A small-scale project activity that is part of a large project activity is not eligible to use the simplified modalities and procedures for small scale CDM project activities.

According to para 2 of appendix C¹

A proposed small scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure;
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

The project activity only comprises installation of energy efficient measures at SIL manufacturing plant at Ankleshwar, and the situations prevailing prior to such implementation has never been considered as a CDM project activity, which confirms the small scale project activity is not a debundled component of a larger project activity.

¹ Appendix C to the simplified M&P for the small scale CDM project activities, <http://cdm.unfccc.int/Projects/pac/ssclistmeth.pdf>

SECTION B. Application of a baseline and monitoring methodology

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

>> **Main Category:** Type II – Energy efficiency improvement projects

Sub Category: II. D-Energy efficiency and fuel switching measures for industrial facilities

The reference has been taken from the list of the small-scale CDM project activity categories contained in ‘Appendix B of the simplified M&P for small-scale CDM project activities-Version 8 (23rd December 2006)’.

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

>> The project activity fits under Type II.D – Energy efficiency and fuel switching measures for industrial facilities under Appendix B as it uses an efficient power generation system with the fuel switching measures for steam and power generation. The indicative simplified baseline and monitoring methodology applicable to category II.D has been used for the project including baseline calculations. The emission reduction calculation is based on specific emissions per unit of power generated or steam generated before and after the project activity. For the calculation of emissions related to steam use, IPCC values are used to estimate GHG emissions from fossil fuel used to produce steam.

The applicability criteria(s) of the applied methodology, AMS II D, with relevant project justification(s), are as follows:

- *The category comprises any energy efficiency and fuel switching measures implemented at a single industrial facility:* The Project is implemented at chemical manufacturing plant of Sajjan India Limited at Ankleshwar.
- *The category covers project activities aimed primarily at energy efficiency:* The project activity primarily aims at energy efficiency improvement through combined heat, power and refrigeration generation as compared to pre project scenario where the grid power was used for chilled water generation and other process uses and lignite was used to produce steam.
- *The project measures may replace, modify or retrofit existing facilities:* The project activity replaces lignite fired boiler with natural gas fired boiler and engine generator (with associated waste heat recovery boilers and VAMs).
- *The aggregate energy savings of a single project may not exceed the equivalent of 60 GWhe per year. A total savings of 60 GWhe per year is equivalent to a maximal saving of 180 GWhth per year in fuel input:* The project activity will reduce the input thermal energy to the tune of 12.85

GWh, which is below the limit of small scale project activity of this category. The project proponent will be within the small scale limit for the same production in future also.

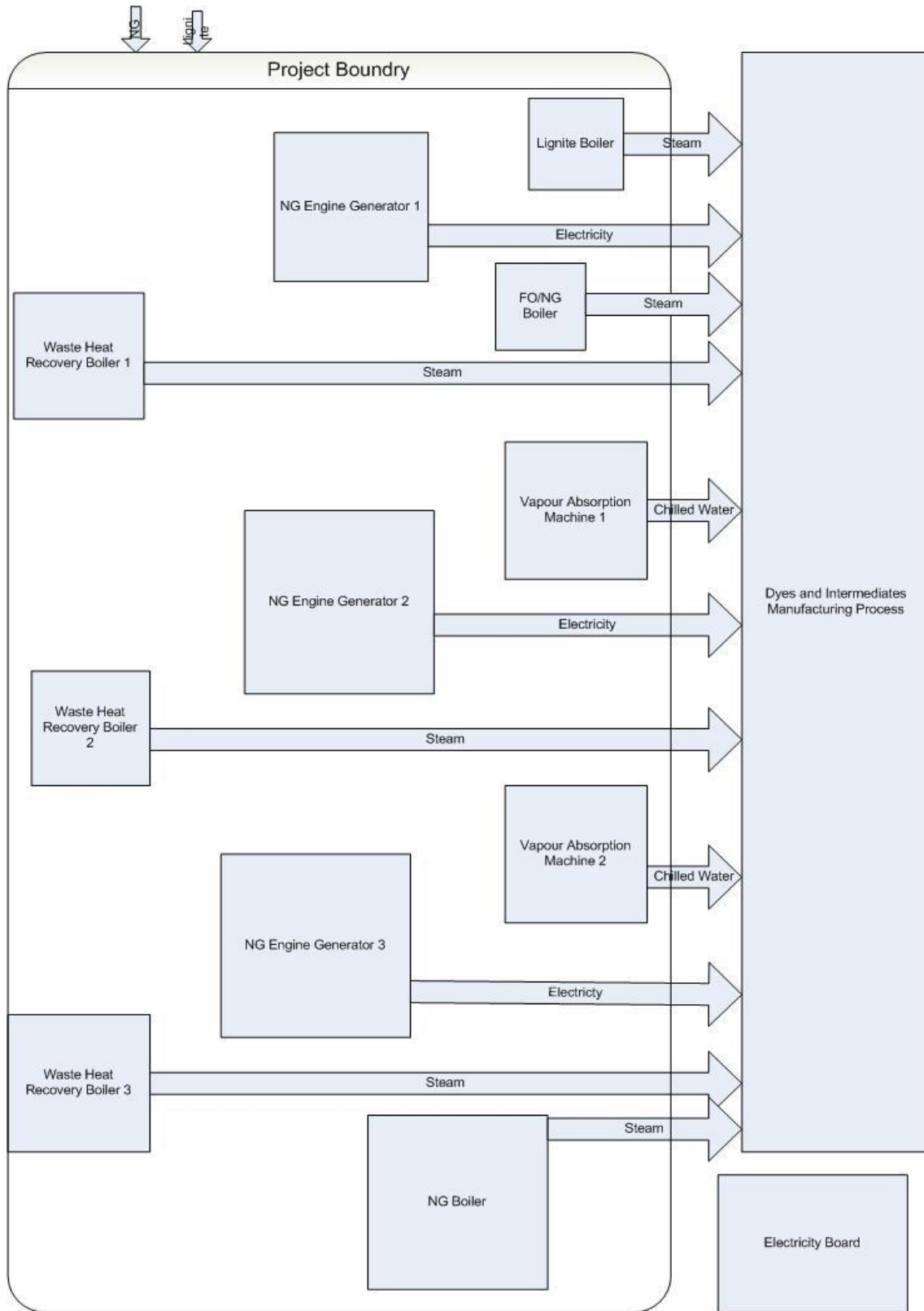
B.3. Description of the project boundary

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The project boundary is NG fired power generation house and boiler house located within the plant (SIL) premises at GIDC, Ankleshwar. Following are the components of project boundary.

1. NG fired engine generator (3 nos.)
2. Lignite fired boiler (1 no.)
3. NG fired boiler (1 no.)
4. Waste heat recovery boiler (3 nos.)
5. Vapor Absorption Machine (2 nos.)
6. FO/NG fired boiler (1 no.)

Pictorial representation of the project boundary is given in the following page:



B.4. Details of the baseline and its development:

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As per Appendix B of the simplified M&P for small-scale CDM project activities of the UNFCCC CDM website the project falls under Category II.D – Energy efficiency and fuel switching measures for industrial facilities.

As per the paragraph 3 of the applied methodology, *the baseline consists of the energy baseline of the existing facility or sub-system that is replaced, modified or retrofitted.* The project activity replaces lignite fired boiler with natural gas fired boiler and engine generator (with associated waste heat recovery boiler and VAMs), avoiding quantities of power from GEB and lignite. In line with the methodology, the energy baseline of power and steam requirements (based on GEB and lignite consumption) has been taken to estimate baseline emission.

As per paragraph 4 of the applied methodology, *each energy form in the emission baseline is multiplied by an emission coefficient (in kgCO₂e/KWh).* For the electricity displaced, the emission coefficient is calculated in accordance with provisions under category I.D. For fossil fuels, the IPCC default values for emission coefficient may be used. In the project baseline scenario, depending on the energy form, a specific emission factor has been used (kgCO₂/TR, kgCO₂/KWh and tCO₂/TJ) and multiplied to get baseline emissions. CEA data has been used for western grid emission factor. Here, the electricity used is multiplied by an emission coefficient (measured in kg CO₂equ/kWh) for the electricity displaced calculated in accordance with provisions of paragraphs 6 or 7 for category I.D project, as per which the emission coefficient (measured in kgCO₂/kWh) is calculated in a transparent and conservative manner as under:

The average of the “approximate operating margin” and the “build margin”, where,

- i) The “approximate operating margin” is the weighted average emissions (in kgCO₂equ/kWh) of all generating sources surviving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation;
- ii) The “build margin” is the weighted average emissions (in kgCO₂equ/kWh) of recent capacity additions to the system, which capacity additions are defined as the greater (in MWh) of the most recent 20% of existing plants or the 5 most recent plants;

At all other places, IPCC emission factors have been used.

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 small scale CDM project activity:

>> In accordance with paragraph 7 of the simplified modalities and procedures for small-scale CDM project activities, a simplified baseline and monitoring methodology listed in Appendix B may be used for a

small-scale CDM project activity if project participants are able to demonstrate to a designated operational entity that the project activity would otherwise not be implemented due to the existence of one or more barrier(s) listed in Attachment A of Appendix. B. These barriers are:

- Investment barrier
- Technological barrier
- Barrier due to prevailing practice
- Other barriers

The implementation of the project activity is a voluntary step undertaken by with no direct or indirect mandate by law.

The main driving force to this 'Climate change initiative' is:

- GHG reduction due to higher efficiency, enhanced waste heat recovery and low carbon intensive fuel
- The reduction in the fossil fuel quantities on account of better efficiencies

However, the project proponent was aware of the various barriers associated to project implementation. But it is realized that the availability of carbon financing against a sale consideration of carbon credits generated due to project activity would help to overcome these barriers. Some of the key barriers are discussed below:

Investment barrier

Alternatives to the project activity:

The other options for power generation for SIL were:

1. Electricity from State Electricity Grid and steam generation from boiler running on Lignite (Pre project practice)
2. Steam Turbine based power plant - Condensing
3. NG fired engine generator (Current Practice)
4. Steam Turbine based power plant – Back Pressure

Investment comparison analysis

The four options were available with the project proponent other than baseline scenario. SIL called for proposals from vendors namely Hi Rel and Jenbacher. The supply of electricity from electricity board is not under project proponent control; therefore this option is not opted in financial calculations. Unit cost of service i.e. leverized cost of electricity production in Rs/KWh of the CDM project activity and its three alternatives is calculated and a comparison is made.

Calculation and comparison of financial indicators

The result of leverized cost of electricity production calculation comparison analysis is as follows:

Option	Unit Cost (Rs/KWh)
Steam Turbine based power plant – Condensing	2.41
NG fired Engine generation	3.136
Steam Turbine based power plant – Back Pressure	0.64
Steam Turbine based power plant – Extraction cum Condensing	1.82

Despite the fact, NG fired engine power generation being expensive in terms of higher unit cost of power generation; SIL went ahead with a view to implement efficient environmental friendly technology considering associated CDM benefits will come later.

Technological barrier: The technological barriers faced by SIL, considering imported genset, were enormous. The lack availability of proper spares and service was always an issue considering the plant is operational throughout the year. Only three Jenbacher & one Doetz gensets were installed in Ankleshwar and nearby region. As the technology, there was no service set up available in India for Jenbacher/Doetz gas engines.

Other barriers: The project requires uninterrupted availability of consistent quality gas supply. SIL, after the project conceptualization, faced a barrier as GGCL expressed their sudden inability to ensure the gas supply. An agreement, between SIL and GGCL on consistent gas supply to the former, could only be signed after 4 months of ordering the genset. Further, there was no agreement on gas price as GGCL did not bind itself for any fixed prices. In case of any break down of genset, gas consumption can go below 80% of contracted quantity and heavy penalties need to be paid to GGCL.

The project proponent, in spite of these risks and barriers identified, still went ahead with the project implementation that will lead to lesser greenhouse gas emission into the atmosphere.

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

>> The procedure followed for estimating the emissions reductions from this project activity during the crediting period are as per the following steps which corresponds with AMS-II.D.

Steps	Description	Equation Used	Methodological Choices
1.	Procedure followed for	The specific emission factor for	The emission factor and

	calculating Specific emission factor for Lignite fired boiler in baseline scenario ($BSEF_{LB}$)	Lignite fired boiler is calculated using equation ($BSEF_{LB} = (Fi \times CV_{i,Lignite} \times OXID_i \times EFi)/(Enthalpy_{Base-LB} * Steam_{Base-LB})$)	oxidation factor values are referred from IPCC reviews. The enthalpy of steam is taken from Steam table.
2.	Procedure followed for calculating Specific emission factor for Chilled water generation ($BSEF_{C-Water}$)	The specific emission factor for Chilled water generation is calculated using equation ($BSEF_{C-Water} = (Elect_{Base-COMP} \times EF_{Grid})/C-Water_{Base-VAM}$)	The grid emission factor EF_{grid} is referred from data published by Central Electricity Authority (CEA).
3.	Procedure followed for estimating Annual baseline emissions ($E_{Baseline}$)	The formula used to calculate baseline emissions is given below: $(E_{Baseline} = (Elect_{Proj-EG} \times EF_{Grid} + Enthalpy_{Proj-WHR} * Steam_{Proj-WHR} \times BSEF_{LB} + Enthalpy_{Proj-NGB} * Steam_{Proj-NGB} \times BSEF_{LB} + Enthalpy_{Proj-FO/NGB} * Steam_{Proj-FO/NGB} \times BSEF_{LB} + C-Water_{Proj-VAM} \times BSEF_{C-Water})/1000)$	The grid emission factor is taken from CEA reviews and enthalpy of steam is taken from steam table.
4.	Procedure followed for calculating Specific emission factor for NG fired engine generator in project activity ($PSEF_{EG}$)	The specific emission factor for NG fired engine generator is calculated using equation ($PSEF_{EG} = (Fi \times CV_{i,NG} \times OXID_i \times EFi)/Elect_{Proj-EG}$)	The emission factor and oxidation factor values are referred from IPCC reviews.
5.	Procedure followed for calculating Specific emission factor for NG fired boiler in project activity ($PSEF_{NBG}$)	The specific emission factor for NG fired boiler is calculated using equation ($PSEF_{NBG} = (Fi \times CV_{i,NG} \times OXID_i \times EFi)/(Enthalpy_{Proj-NGB} * Steam_{Proj-NGB})$)	The emission factor and oxidation factor values are referred from IPCC reviews. The enthalpy of steam is taken from Steam table.

6.	Procedure followed for calculating Specific emission factor for FO/NG fired boiler in project activity ($PSEF_{NBG}$)	The specific emission factor for FO/NG fired boiler is calculated using equation ($PSEF_{FO/NG} = (F_i \times CV_i \times OXID_i \times EFi) / (Enthalpy_{Proj-FO/NG} * Steam_{Proj-FO/NG})$)	The emission factor and oxidation factor values are referred from IPCC reviews. The enthalpy of steam is taken from Steam table.
7.	Procedure followed for estimating Annual project emissions ($E_{Project}$)	The formula used to calculate project emissions is given below: $(E_{Project} = (PSEF_{EG} \times Elect_{Proj-EG} + PSEF_{NBG} \times Steam_{Proj-NBG} + PSEF_{FO/NG} \times Steam_{Proj-FO/NG}) / 1000)$	-
8.	Procedure followed to calculate emission reductions (ER)	The equation used to calculate emission reductions ($ER = E_{baseline} - E_{project}$)	-

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

Data / Parameter:	F_i
Data unit:	Tons
Description:	Consumption of fuel i used in the baseline scenario
Source of data used:	Plant
Value applied:	2605
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data has been taken from the plant. QMS procedures are followed in measurement and reporting of this value.
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	$CV_{i, \text{Lignite}}$
Data unit:	GJ/ton
Description:	Net Calorific value of Lignite i used in the baseline scenario
Source of data used:	Plant
Value applied:	13.376
Justification of the	The data has been taken from the plant. QMS procedures are followed in

choice of data or description of measurement methods and procedures actually applied :	measurement and reporting of this value.
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	$EF_{i, \text{Lignite}}$
Data unit:	kgCO ₂ /GJ
Description:	Emission factor per unit energy of Lignite
Source of data used:	IPCC
Value applied:	101.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	The emission factor value is referred from IPCC reviews.
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	$OXID_{\text{Lignite}}$
Data unit:	-
Description:	Oxidation factor of Lignite
Source of data used:	IPCC
Value applied:	0.98
Justification of the choice of data or description of measurement methods and procedures actually applied :	The emission factor value is referred from IPCC reviews.
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	Steam _{Base-LB}
Data unit:	Tons
Description:	Steam produced by Lignite fired boiler in baseline scenario
Source of data used:	Plant
Value applied:	10989
Justification of the choice of data or description of	The data has been taken from the plant. QMS procedures are followed in measurement and reporting of this value.

measurement methods and procedures actually applied :	
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	Enthalpy _{Base-LB}
Data unit:	KJ/Kg
Description:	Enthalpy of steam produced in the baseline scenario
Source of data used:	Steam table
Value applied:	2781.3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The enthalpy value is referred from Steam table.
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	BSEF _{LB}
Data unit:	tCO ₂ /TJ of steam produced
Description:	Baseline specific emission factor for Lignite fired boiler
Source of data used:	Plant
Value applied:	112.95
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data has been taken from the plant. QMS procedures are followed in measurement and reporting of this value.
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	Elect _{Base-COMP}
Data unit:	KWh
Description:	Energy Consumed by chilling compressors
Source of data used:	Plant
Value applied:	401200
Justification of the choice of data or description of measurement methods	The data has been taken from the plant. QMS procedures are followed in measurement and reporting of this value.

and procedures actually applied :	
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	EF _{Grid}
Data unit:	kg CO ₂ /KWh
Description:	Emission Factor of the Grid
Source of data used:	Plant
Value applied:	0.89
Justification of the choice of data or description of measurement methods and procedures actually applied :	The emission factor value is referred from CEA reviews.
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	C-Water _{Base}
Data unit:	TR
Description:	Baseline chilled water generation
Source of data used:	Plant
Value applied:	472000
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data has been taken from the plant. QMS procedures are followed in measurement and reporting of this value.
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	BSEF _{C-Water}
Data unit:	kgCO ₂ /TR
Description:	Baseline Specific emission factor for chilled water generation
Source of data used:	Plant
Value applied:	0.757
Justification of the choice of data or description of	The data has been taken from the plant. QMS procedures are followed in measurement and reporting of this value.

measurement methods and procedures actually applied :	
Any comment:	Data will be kept for crediting period + 2 years.

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

Step 1: Specific emission factor for each generation device:

1. For NG fired engine Generators

$$PSEF_{EG} = (F_i \times CV_i \times OXID_i \times EFi) / Elect_{Proj-EG} \dots \dots \dots (1)$$

Where

- PSEF_{EG} = Project specific emission factor for NG fired engine generator (kgCO₂/KWh)
- F_i = Consumption of fuel i used in the project scenario (SCM)
- CV_i = Calorific value of fuel i used in the project scenario (GJ/SCuM)
- EF_i = Carbon dioxide mission factor per unit energy of fuel i (kgCO₂/GJ)
- OXID_i = IPCC Oxidation factor for fuel i
- Elect_{Proj-EG} = Electricity generated by engine generators in project scenario (KWh)

$$Elect_{Proj-EG} = Gross-Elect_{Proj-EG} - Aux-Elect_{Proj-EG}$$

Where

- Gross-Elect_{Proj-EG} = Gross electricity generated by engine generators in project scenario (KWh)
- Aux-Elect_{Proj-EG} = Auxiliary consumption in engine generators in project scenario (KWh)

$$PSEF_{EG} = (5942860 * 0.035 * 0.995 * 56.1 / (21610400 - 650000))$$

Applying values from section B.6.2 and B.7.1, PSEF_{EG} comes out to be 0.562 tCO₂/KWh.

2. For NG fired boiler

$$PSEF_{NGB} = (F_i \times CV_i \times OXID_i \times EFi) / (Enthalpy_{Proj-NGB} * Steam_{Proj-NGB} \dots \dots \dots (2)$$

Where

- PSEF_{NGB} = Project specific emission factor for NG fired boiler (tCO₂/TJ of steam produced)
- F_i = Consumption of fuel i used in the project scenario (SCuM)
- CV_i = Calorific value of fuel i used in the project scenario (GJ/SCuM)
- EF_i = Carbon dioxide emission factor per unit energy of fuel i (kgCO₂/GJ)
- OXID_i = IPCC Oxidation factor for fuel i
- Steam_{Proj-NGB} = Steam generated by NG fired boiler in project scenario (Tons)
- Enthalpy_{Proj-NGB} = Enthalpy of steam produced by NG fired boiler in project scenario (KJ/Kg)

$$PSEF_{NBG} = (6177275 * 0.035 * 0.995 * 56.1 * 10^9) / (3105.7 * 64000)$$

Applying values from section B.6.2 and B.7.1, $PSEF_{EG}$ comes out to be 61654810.28 tCO₂/TJ of steam produced.

3. For FO/ NG fired boiler

$$PSEF_{FO/NGB} = (F_i \times CV_i \times OXID_i \times EFi) / (Enthalpy_{Proj-FO/NGB} * Steam_{Proj-FO/NGB}) \dots \dots \dots (3)$$

Where

- $PSEF_{FO/NGB}$ = Project specific emission factor for FO/NG fired boiler (tCO₂/TJ of steam produced)
- F_i = Consumption of fuel i used in the project scenario (SCuM)
- CV_i = Calorific value of fuel i used in the project scenario (GJ/SCuM)
- EF_i = Carbon dioxide emission factor per unit energy of fuel i (kgCO₂/GJ)
- $OXID_i$ = IPCC Oxidation factor for fuel i
- $Steam_{Proj-FO/NGB}$ = Steam generated by FO/NG fired boiler in project scenario (Tons)
- $Enthalpy_{Proj-FO/NGB}$ = Enthalpy of steam produced by FO/NG fired boiler in project scenario (KJ/Kg)

$$PSEF_{FO/NGB} = (2556114 * 0.035 * 0.995 * 56.1 * 10^9) / (2781.3 * 26483)$$

Applying values from section B.6.2 and B.7.1, $PSEF_{FO/NGB}$ comes out to be 68845987.23 tCO₂/TJ of steam produced.

Step 2: Annual project emission

$$E_{Project} = (PSEF_{EG} \times Elect_{Proj-EG} + PSEF_{NGB} \times Steam_{Proj-NGB} \times Enthalpy_{Proj-NGB} + PSEF_{FO/NGB} \times Steam_{Proj-FO/NGB} \times Enthalpy_{Proj-FO/NGB}) / 1000 \dots \dots \dots (4)$$

Where

- $E_{Project}$ = Emission from the project activity (tCO₂)

$$E_{Project} = (0.562 * 20960400 + 61654810.28 * 64000 * 3105.7 / 10^{12} + 68845987.23 * 26483 * 2781.3 / 10^{12}) / 1000$$

Applying values from section B.6.2 and B.7.1, $E_{Project}$ comes out to be 29057 tCO₂.

Baseline emission calculation:

Step 3: Specific emission factor for each generation device:

1. For Lignite Fired Boiler

$$BSEF_{LB} = (F_i \times CV_i \times OXID_i \times EFi) / (Enthalpy_{Base-LB} * Steam_{Base-LB}) \dots \dots \dots (5)$$

Where

- $BSEF_{LB}$ = Baseline specific emission factor for Lignite fired boiler (tCO₂/TJ of steam produced)
- F_i = Consumption of fuel i used in the baseline scenario (Tons)
- CV_i = Calorific value of fuel i used in the baseline scenario (GJ/ton)
- EF_i = Emission factor per unit energy of fuel i (tCO₂/GJ)
- $OXID_i$ = IPCC Oxidation factor for fuel i
- $Steam_{Base-LB}$ = Steam produced by Lignite fired boiler in baseline scenario (Tons)

$Enthalpy_{Base-LB}$ = Enthalpy of steam produced in the baseline scenario (KJ/Kg)

$$BSEF_{LB} = (2605 * 13.37 * 0.98 * 101.1 * 10^6) / (2781.3 * 10989 * 1000)$$

Applying values from section B.6.2 and B.7.1, $BSEF_{LB}$ comes out to be 112.95 tCO₂.

2. For Chilled Water Generation

$$BSEF_{C-Water} = (Elect_{Base-COMP} * EF_{Grid}) / C-Water_{Base-VAM} \dots \dots \dots (6)$$

Where

- $BSEF_{C-Water}$ = Baseline Specific emission factor for chilled water generation (kgCO₂/TR)
- $Elect_{Base-COMP}$ = Energy Consumed by chilling compressors (KWh)
- EF_{Grid} = Emission Factor of the Grid (kg CO₂/KWh)
- $C-Water_{Base}$ = Baseline chilled water generation (TR)

$$BSEF_{C-Water} = (401200 * 0.89) / 472000$$

Applying values from section B.6.2 and B.7.1, $BSEF_{C-Water}$ comes out to be 0.757 kgCO₂/TR.

Step 4: Annual baseline emission

$$E_{Baseline} = (Elect_{Proj-EG} * EF_{Grid} + Enthalpy_{Proj-WHR} * Steam_{Proj-WHR} * BSEF_{LB} + Enthalpy_{Proj-NGB} * Steam_{Proj-NGB} * BSEF_{LB} + Enthalpy_{Proj-FO/NGB} * Steam_{Proj-FO/NGB} * BSEF_{LB} + C-Water_{Proj-VAM} * BSEF_{C-Water}) / 1000 \dots \dots \dots (7)$$

Where

- $E_{Baseline}$ = Emissions from the baseline activity (tCO₂)
- EF_{Grid} = Grid emission factor (kg CO₂/ KWh)
- $BSEF_{LB}$ = Baseline specific emission factor for Lignite fired boiler (tCO₂/TJ of steam produced)
- $Steam_{Proj-WHR}$ = Steam generated by the waste heat recovery boilers in project scenario (Tons)
- $Steam_{Proj-NGB}$ = Steam generated by the NG fired boiler in project scenario (Tons)
- $Steam_{Proj-FO/NGB}$ = Steam generated by the NG fired boiler in project scenario (Tons)
- $Enthalpy_{Proj-WHR}$ = Enthalpy of steam generated by WHR boiler in project scenario (KJ/Kg)
- $Enthalpy_{Proj-NGB}$ = Enthalpy of steam generated by WHR boiler in project scenario (KJ/Kg)
- $Enthalpy_{Proj-FO/NGB}$ = Enthalpy of steam generated by WHR boiler in project scenario (KJ/Kg)
- $C-Water_{Proj-VAM}$ = Chilled water generated in VAMs in project scenario (TR)
- $Elect_{Proj-EG}$ = Electricity generated by the natural gas fired engine generators in project scenario, this is equivalent to electricity procured from the grid in baseline scenario.
- $BSEF_{C-Water}$ = Baseline Specific emission factor for chilled water generation (kgCO₂/TR)

$$E_{Baseline} = (20960400 * 0.89 + (13000 * 2781.3 * 1000 + 26483 * 2781.3 * 1000 + 64000 * 3105.7 * 1000) * 112.95 / 10^6 + 1690000 * 0.757) / 1000$$

Applying values from section B.6.2 and B.7.1, $E_{Baseline}$ comes out to be 54789 tCO₂.

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

>>

Year	Estimated Project	Estimated Baseline	Estimated	Estimated
------	-------------------	--------------------	-----------	-----------

	Activity Emissions (tonnes of CO ₂ e)	Emissions (tonnes of CO ₂ e)	leakage(tonnes of CO ₂ e)	Emission Reduction (tonnes of CO ₂ e)
2007-08	29057	54789	0	25732
2008-09	29057	54789	0	25732
2009-10	29057	54789	0	25732
2010-11	29057	54789	0	25732
2011-12	29057	54789	0	25732
2012-13	29057	54789	0	25732
2013-14	29057	54789	0	25732
2014-15	29057	54789	0	25732
2015-16	29057	54789	0	25732
2016-17	29057	54789	0	25732
Total	290570	5,47,890	0	2,57,320

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

>>

The following two sections (B.7.1 & B.7.2) provides a detailed description of the application of the monitoring methodology and description of the monitoring plan, including identification of the data to be monitored and the procedures that will be applied during monitoring.

Please note that data monitored and required for verification and issuance are to be kept for two years after the end of crediting period or the last issuance of CERs for this project activity, which ever occurs later.

B.7.1 Data and parameters monitored:

>>

Data / Parameter:	F _{i,NG}
Data unit:	SCM
Description:	Consumption of NG used in the project scenario
Source of data to be used:	Plant.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	5942860
Description of measurement methods and procedures to be applied:	<u>Monitoring:</u> flow meters at the plant and DCS will measure the data. <u>Data type:</u> measured

	<u>Archiving procedure:</u> Paper and Electronic <u>Recording Frequency:</u> Daily <u>Responsibility:</u> Head (Technical Department) would be responsible for regular calibration of the meter. <u>Calibration Frequency:</u> Annually.
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project site
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	$CV_{i,NG}$
Data unit:	GJ/SCM
Description:	Calorific value of NG used in the project scenario
Source of data to be used:	Plant.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.035
Description of measurement methods and procedures to be applied:	<u>Monitoring:</u> value taken from data provided by the supplier. <u>Data type:</u> estimated <u>Archiving procedure:</u> Paper and Electronic <u>Recording Frequency:</u> Monthly <u>Responsibility:</u> Head (Technical Department) would be responsible for regular reporting of the parameter.
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project site
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	$Elect_{Proj-EG}$
Data unit:	KWh
Description:	Electricity generated by engine generators in project scenario
Source of data to be used:	Plant.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	20960400
Description of measurement methods and procedures to be applied:	<u>Monitoring:</u> energy meter will be used in monitoring the parameter. <u>Data type:</u> measured

	<u>Archiving procedure:</u> Paper and Electronic <u>Recording Frequency:</u> Daily <u>Responsibility:</u> Head (Technical Department) would be responsible for regular calibration of the meter <u>Calibration frequency:</u> Annually
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project site
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	$PSEF_{EG}$
Data unit:	kgCO ₂ /KWh
Description:	Project specific emission factor for NG fired engine generator
Source of data to be used:	Plant.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.562
Description of measurement methods and procedures to be applied:	<u>Data type:</u> calculated <u>Archiving procedure:</u> Paper and Electronic <u>Recording Frequency:</u> Annually <u>Responsibility:</u> Head (Technical Department) would be responsible for reporting of the parameter
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project site
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	$F_{I,NGB}$
Data unit:	SCM
Description:	Consumption of NG in boiler in the project scenario
Source of data to be used:	Plant.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	6177275
Description of measurement methods and procedures to be applied:	<u>Monitoring:</u> flow meters at the plant and DCS will measure the data. <u>Data type:</u> measured <u>Archiving procedure:</u> Paper and Electronic <u>Recording Frequency:</u> Daily <u>Responsibility:</u> Head (Technical Department) would be responsible for regular calibration of the meter. <u>Calibration Frequency:</u> Annually.

QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project site
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	Steam _{Proj-NGB}
Data unit:	Tons
Description:	Steam generated by NG fired boiler in project scenario
Source of data to be used:	Plant.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	64000
Description of measurement methods and procedures to be applied:	<p><u>Monitoring:</u> flow meters at the plant and DCS will measure the data.</p> <p><u>Data type:</u> measured</p> <p><u>Archiving procedure:</u> Paper and Electronic</p> <p><u>Recording Frequency:</u> Daily</p> <p><u>Responsibility:</u> Head (Technical Department) would be responsible for regular calibration of the meter.</p> <p><u>Calibration Frequency:</u> Annually.</p>
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project site
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	Enthalpy _{Proj-NGB}
Data unit:	KJ/Kg
Description:	Enthalpy of steam produced by NG fired boiler in project scenario
Source of data to be used:	Plant.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	3105.7
Description of measurement methods and procedures to be applied:	<p><u>Monitoring:</u> The value is referred from steam table</p> <p><u>Data type:</u> estimated</p> <p><u>Archiving procedure:</u> Paper and Electronic</p>

	<u>Recording Frequency:</u> Monthly <u>Responsibility:</u> Head (Technical Department) would be responsible for reporting of the parameter.
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project site
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	$F_{i,FO/NGB}$
Data unit:	SCM
Description:	Consumption of NG in boiler in the project scenario
Source of data to be used:	Plant.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	2556114
Description of measurement methods and procedures to be applied:	<u>Monitoring:</u> flow meters at the plant and DCS will measure the data. <u>Data type:</u> measured <u>Archiving procedure:</u> Paper and Electronic <u>Recording Frequency:</u> Daily <u>Responsibility:</u> Head (Technical Department) would be responsible for regular calibration of the meter. <u>Calibration Frequency:</u> Annually.
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project site
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	Steam _{Proj-FO/NGB}
Data unit:	Tons
Description:	Steam generated by NG fired boiler in project scenario
Source of data to be used:	Plant.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	26483
Description of measurement methods and procedures to be applied:	<u>Monitoring:</u> flow meters at the plant and DCS will measure the data. <u>Data type:</u> measured <u>Archiving procedure:</u> Paper and Electronic <u>Recording Frequency:</u> Daily <u>Responsibility:</u> Head (Technical Department) would

	be responsible for regular calibration of the meter. <u>Calibration Frequency:</u> Annually.
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project site
Any comment:	Data archived: Crediting period + 2 yrs

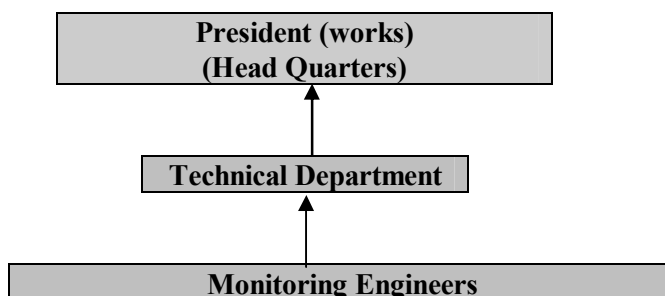
Data / Parameter:	Enthalpy _{Proj-FO/NGB}
Data unit:	KJ/Kg
Description:	Enthalpy of steam produced by NG fired boiler in project scenario
Source of data to be used:	Plant.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	2781.3
Description of measurement methods and procedures to be applied:	<u>Monitoring:</u> The value is referred from steam table <u>Data type:</u> estimated <u>Archiving procedure:</u> Paper and Electronic <u>Recording Frequency:</u> Monthly <u>Responsibility:</u> Head (Technical Department) would be responsible for reporting of the parameter.
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project site
Any comment:	Data archived: Crediting period + 2 yrs

B.7.2 Description of the monitoring plan:

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Emission monitoring and calculation procedure will follow the following organizational structure. All data and calculation formula required to proceed is given in the section B.6.3.

Organizational Structure for monitoring



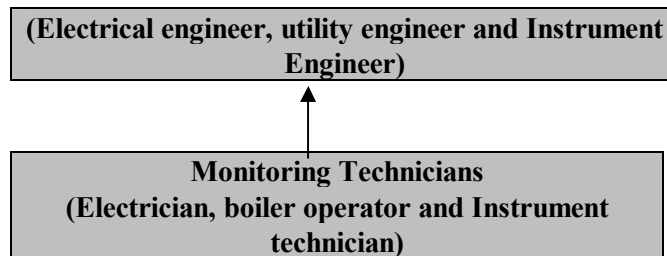


Table 4: Monitoring and Calculation Activities and responsibility

Monitoring and calculation activities	Procedure and responsibility
Data Source and Collection	Readings of various meters will be recorded by technicians.
Frequency	Monitoring frequency should be as per section B of PDD
Review	All received data is reviewed by engineers in CDM cell
Data compilation	All the data is compiled and stored in CDM cell
Emission calculation	Emission reduction calculation will be done annual based on the data collected. Engineers/Project In charge of CDM cell will do the calculations
Review	Plant In charge will review the calculation
Emission data review	Final calculations is reviewed and approved by Vice President
Record Keeping	All calculation and data record will be kept with the CDM cell.

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)

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Date of completing the final draft of this baseline and monitoring methodology:
19.02.2007

Name of the person/entity determining the baseline:
 Sajjan India Limited & their associated consultants

SECTION C. Duration of the project activity / Crediting period:

C.1. Duration of the small-scale project activity:

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C.1.1. Starting date of the small-scale project activity:

17/11/2002

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

15 Years 0 months

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

>>

C.2.1. Renewable crediting period:

Not Applicable

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

Not Applicable

C.2.1.2. Length of the first crediting period:

Not Applicable

C.2.2. Fixed crediting period:

>>

C.2.2.1. Starting date:

Starting date (DD/MM/YY): Crediting period would start from the date of registration of the project

C.2.2.2. Length:

10 years 0 months

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

The Ministry of Environment and Forests (MoEF), Government of India, under the Environment Impact Assessment Notification vide S.O. 60(E) dated 27/01/94 has listed a set of industrial activities in Schedule I² of the notification which for setting up new projects or modernization/ expansion will require environmental clearance and will have to conduct an Environment Impact Assessment (EIA) study. However, the project under consideration does not require any EIA to be conducted as the activity is not included in Schedule I.

Article 12 of the Kyoto Protocol requires that a CDM project activity contribute to the sustainable development of the host country. Assessing the project activity's positive and negative impacts on the local environment and on society is thus a key element for each CDM project.

SIL's CDM project activity ensures maximum global and local benefits in relation to certain environmental and social issues and is a small step towards sustainable development.

The primary objective of the project is to reduce the emissions. By this way project activity reduces environmental impacts related to emissions from steam and power consumption.

The project activity does not have any significant negative environmental impact at the site. The GHG emission reductions from project activity benefit the global environment. The short summary of Environmental impacts is given in table.

Environment Impact Assessment table

SL. NO.	ENVIRONMENTAL IMPACTS & BENEFITS	REMARKS
A.	CATEGORY: ENVIRONMENTAL – AIR QUALITY	
1.	The project activity is using natural gas as fuel for steam and power generation. Natural gas is cleanest fossil fuel, so the activity has reduced the emissions based on the grid based electricity and lignite fired boiler steam – the case earlier.	The project activity reduces emission of CO ₂ -a global entity.
B	CATEGORY: ENVIRONMENTAL – WATER	
1	The project activity does not contribute to water pollution	
D	CATEGORY: ENVIRONMENTAL – NOISE GENERATION	
1	The project does not contribute to noise pollution.	

² <http://www.envfor.nic.in/legis/eia>

SECTION G. Stakeholders' comments:

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

SIL had organized stakeholder consultation meetings with local stakeholders, employees in the area with the objective to inform the interested stakeholders on the environmental and social impacts of the project activity and discuss their concerns regarding the project activity. Invitation for stakeholder consultation meetings were sent out requesting the members to participate and communicate any suggestions/objections regarding the project activity.

The other stakeholders identified for the project activity were as under:

1. Local population
2. Employees
3. State pollution control board
4. Consultants
5. Gujarat Gas Company Limited
6. Equipment suppliers

Stakeholders list includes the government and non-government parties, which are involved in the project activity at various stages. At the appropriate stage of the project development, consulted/would consult stakeholders / relevant bodies to get the comments. The comments received are available on request.

G.2. Summary of the comments received:

Local population comprises of the local people in and around the project area. The project activity was implemented inside the boundaries of SILs Ankleshwar plant and did not require any displacement of local population. Thus, there would be no adverse impact on the local population. SIL has completed the necessary consultation with the local population and received positive comments.

Gujarat State Pollution Control Board (GSPCB) has prescribed standards for environmental compliance and monitors the adherence to the standards. GSPCB has granted Consent to Establish (CTE) and consent to operate (CTO).

The village panchayat and suppliers of equipments have lauded the efforts of SIL towards cleaner and efficient operation at its premises.

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

No negative comments received on the project activity.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Sajjan India Limited
Street/P.O.Box:	Senapati Bapat Marg, Lower Parel
Building:	Matulya Centre, #2 Ground Floor
City:	Mumbai
State/Region:	Maharashtra
Postfix/ZIP:	400 013
Country:	India
Telephone:	91 22/24974400/ 24974401
FAX:	91 22/24950588/24951098
E-Mail:	sil@sajjan.com , sajjan@bom2.vsnl.net.in
URL:	www.sajjanindia.com
Represented by:	
Title:	Vice President
Salutation:	Mr.
Last Name:	Todi
Middle Name:	-
First Name:	Vijaykumar
Department:	-
Mobile:	
Direct FAX:	91 22/24950588/24951098
Direct tel:	-
Personal E-Mail:	ykt@sajjan.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding received for the project.

Appendix II : Grid Emission Factor

Source : www.cea.nic.in (Calculation as per ACM0002 Ver 06)

Weighted Average Emission Rate (tCO2/MWh)					
	2000/01	2001/02	2002/03	2003/04	2004/05
North	0.71	0.73	0.74	0.71	0.72
East	1.10	1.04	1.09	1.07	1.06
South	0.75	0.75	0.83	0.84	0.78
West	0.93	1.02	0.94	0.90	0.92
North-East	0.37	0.37	0.34	0.36	0.45
India	0.83	0.86	0.87	0.85	0.84
Simple Operating Margin (tCO2/MWh)					
	2000/01	2001/02	2002/03	2003/04	2004/05
North	0.95	0.98	1.00	0.99	0.98
East	1.23	1.19	1.18	1.19	1.18
South	1.03	1.01	1.02	1.01	1.00
West	1.02	1.12	1.03	0.99	1.01
North-East	0.66	0.65	0.65	0.61	0.79
India	1.02	1.06	1.04	1.02	1.02
Build Margin (tCO2/MWh) (not adjusted for imports)					
	2000/01	2001/02	2002/03	2003/04	2004/05
North					0.54
East					0.86
South					0.73
West					0.77
North-East					0.09
India					0.70
Combined Margin in tCO2/MWh (incl. Imports)					
	2000/01	2001/02	2002/03	2003/04	2004/05
North	0.74	0.76	0.77	0.76	0.76
East	1.05	1.03	1.02	1.03	1.02
South	0.88	0.87	0.88	0.87	0.86
West	0.90	0.94	0.90	0.88	0.89
North-East	0.38	0.37	0.37	0.35	0.44
India	0.86	0.88	0.87	0.86	0.86

Gross Generation Total (GWh)					
	2000/01	2001/02	2002/03	2003/04	2004/05
North	144,290	151,190	155,331	165,717	168,735
East	58,327	63,583	65,332	75,249	85,435
South	128,805	131,747	134,231	138,371	143,932
West	159,865	165,500	173,402	172,480	183,755
North-East	5,206	5,243	5,486	5,879	7,904
India	496,493	517,262	533,780	557,696	589,761
20% of Gross Generation (GWh)					
	2000/01	2001/02	2002/03	2003/04	2004/05
North	28,858	30,238	31,066	33,143	33,747
East	11,665	12,717	13,066	15,050	17,087
South	25,761	26,349	26,846	27,674	28,786

West	31,973	33,100	34,680	34,496	36,751
North-East	1,041	1,049	1,097	1,176	1,581
Net Generation Total (GWh)					
	2000/01	2001/02	2002/03	2003/04	2004/05
North	135,254	141,420	144,676	155,017	157,269
East	52,797	57,654	58,988	68,317	77,967
South	121,040	123,473	125,268	128,225	134,552
West	148,067	152,789	160,615	159,638	170,580
North-East	5,085	5,126	5,372	5,758	7,776
India	462,243	480,463	494,918	516,956	548,144
20% of Net Generation (GWh)					
	2000/01	2001/02	2002/03	2003/04	2004/05
North	27,051	28,284	28,935	31,003	31,454
East	10,559	11,531	11,798	13,663	15,593
South	24,208	24,695	25,054	25,645	26,910
West	29,613	30,558	32,123	31,928	34,116
North-East	1,017	1,025	1,074	1,152	1,555
Share of Must-Run (Hydro/Nuclear) (%)					
	2000/01	2001/02	2002/03	2003/04	2004/05
North	25.9%	25.7%	26.1%	28.1%	26.8%
East	10.9%	13.5%	7.6%	10.3%	10.5%
South	28.1%	25.5%	18.6%	16.2%	21.6%
West	8.3%	8.5%	8.4%	9.1%	8.8%
North-East	43.1%	42.4%	48.4%	41.8%	55.4%
Net Generation OM (GWh)					
	2000/01	2001/02	2002/03	2003/04	2004/05
North	100,214	105,082	106,875	111,424	115,129
East	47,017	49,865	54,523	61,267	69,745
South	86,996	91,946	101,928	107,456	105,445
West	135,726	139,838	147,056	145,122	155,586
North-East	2,892	2,952	2,774	3,350	3,469
India	372,845	389,683	413,156	428,619	449,374

IMPORT DATA					
Net Imports (GWh)					
	2000/01	2001/02	2002/03	2003/04	2004/05
North	0	0	0	0	3,616
East	489	555	357	1,689	0
South	1,162	1,357	518	0	0
West	321	0	797	962	285
North-East	0	0	0	0	2,099
Share of Net Imports (%)					
	2000/01	2001/02	2002/03	2003/04	2004/05
North	0.0%	0.0%	0.0%	0.0%	2.3%
East	0.9%	1.0%	0.6%	2.5%	0.0%
South	1.0%	1.1%	0.4%	0.0%	0.0%
West	0.2%	0.0%	0.5%	0.6%	0.2%
North-East	0.0%	0.0%	0.0%	0.0%	27.0%

Gross Generation BM (GWh)					
	2000/01	2001/02	2002/03	2003/04	2004/05
North					34,283

East					17,394
South					30,091
West					40,286
North-East					2,067
India					124,121
Net Generation BM (GWh)					
	2000/01	2001/02	2002/03	2003/04	2004/05
North					32,293
East					16,042
South					28,165
West					37,837
North-East					2,052
India					116,389

EMISSION DATA					
Absolute Emissions Total (tCO2)					
	2000/01	2001/02	2002/03	2003/04	2004/05
North	95,563,002	102,909,475	106,874,884	110,045,815	112,109,909
East	57,830,162	61,238,587	66,085,166	74,919,620	84,395,050
South	89,079,903	92,464,571	104,399,643	108,265,267	105,090,651
West	138,485,626	156,449,139	151,385,665	144,340,246	157,882,622
North-East	1,899,897	1,914,716	1,815,717	2,056,883	2,255,262
India	382,858,591	414,976,488	430,561,074	439,627,831	461,733,493
Absolute Emissions OM (tCO2)					
	2000/01	2001/02	2002/03	2003/04	2004/05
North	95,563,002	102,909,475	106,874,884	110,045,815	112,109,909
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India	382,858,591	414,976,488	430,561,074	439,627,831	461,733,493
Absolute Emissions BM (tCO2)					
	2000/01	2001/02	2002/03	2003/04	2004/05
North					17,287,345
East					13,828,319
South					20,491,417
West					29,193,210
North-East					191,174
India					80,991,465

