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

**CONTENTS**



**Annexes**

**Revision history of this document**

| Version Number | Date | Description and reason of revision |
|---|---|---|
| 01 | 21 January 2003 | Initial adoption |
| 02 | 8 July 2005 | • The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document.<br>• 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 | 22 December 2006 | • 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 and fuel switch project at GHCL Ltd.

**Version: 01**
**Date: 16/10/2007**

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

>>

Back ground of the project

GHCL Ltd is engaged in the weaving, state of art processing and make up activities in its textile unit located at village Bhilad, Gujarat – India. The final products are bed sheet sets and curtain panels

Purpose of the project

This project activity comprises of commissioning and operation of a new energy efficient 5.67 MW gas turbine with Waste heat recovery system for electricity and steam generation at the industrial facility of GHCL Ltd. The project activity will partially replace the use of 1250 KVA DG set and Man B&W DG set (which are having lower thermal efficiency in comparison with Gas Turbine) for electricity generation and partially replace the use of boiler for steam generation. The Man B&W DG set is being fired with Furnace Oil (with HSD being used as start-up fuel). The 1250 KVA DG set is being fired with HSD and is used only in case of emergency.

The project activity also involves fuel switch from more GHG intensive fuels (Furnace Oil and H.S.D) to lower GHG intensive fuel (N.G) for the electricity and steam generation at the industrial facility. The fuel switch measure for electricity generation for the industrial facility of GHCL Ltd, Bhilad will happen due to installation of new Natural Gas based Gas turbine which will replace the use of 1250 KVA DG set fired with H.S.D. and Man B&W DG set being fired Furnace Oil (with HSD being used as start-up fuel). The fuel switch measure for steam generation is happening at the existing dual fired SM Thermax boiler where switching of fuel from furnace oil to natural gas is done.

The objective of the project activity is reducing the anthropogenic GHG emissions into the atmosphere by energy efficiency measures and switching of fuel from more GHG intensive fuels (HSD & F.O) to natural gas for electricity generation and from F.O. to natural gas for steam.

**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[1].

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

**Social well being**

- The project demonstrates harnessing electricity and steam from cleaner source of fuel (natural gas).
- The project will create gainful employment opportunities for the educated / skilled manpower of the region for the operation of NG based Gas Turbine

**Environmental well being**

- the project activity would lead to decrease in the anthropogenic GHG emissions into the atmosphere due to the use of energy efficient gas turbine and use of relatively cleaner fuel (Natural Gas)
- The project activity will drastically reduce the level of local air pollutants in the surrounding region of the textile unit.

**Economic well being**

- This project will demonstrate the use of new financial mechanism (CDM) in raising finance for power generation through fuel switch project.

**Technological well being**

- The project activity would provide competency in people for operation of the Natural Gas based Gas Turbine technology.

**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) | GHCL Limited | No |
| United Kingdom | Cantor Fitzgerald Europe | No |

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

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

>>

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

>>
India

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

>>
Western Region, Gujarat

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

>>
Vapi

**A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :**

>>
The GHCL Limited's textile unit is located in Bhilad Village, Valsad District, Gujarat State.

The project site is located at $20.15^0$ North latitude and $72.45^0$ East Longitude. It is located near the National Highway Number 8. Vapi is the nearest railway station and Daman airport is the nearest airport.


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

>>
**Project Category**
**Type II:Energy Efficiency Improvement Projects**
**Category IID: Energy efficiency and fuel switching measures for industrial facilities**
**II.D./Version 10**
**Sectoral Scope: 4**
**EB 33**

**Technology that was employed by the project activity**

The following is the technical specification of the Gas Turbine:

| | |
|---|---|
| Manufacturer | Solar |
| Installed Capacity | 5.67 MW |
| Model | Taurus 60 (T60-7901) |
| Operation | Continuous |
| Turbine Design | Open Cycle, Single Shaft, Cold-end drive |
| Compressor | 12 stage, axial |
| Compression ratio | 12:1 |
| Combustion Chamber | Annular with 12 injectors |
| Turbine | 3 stage, axial-reaction |
| Turbine Speed | 14944 rpm |
| Nominal shaft power rating | 5946 kW |
| Heat Input | 17995kJ/s |
| Turbine air inlet flow | 21.36 kg/s |
| Exhaust gas temperature | 511 $^0$ C |
| Exhaust gas mass flow | 21.74 kg/s |
| Thrust bearing | Tilting pad type |

All performance data at ISO conditions

All the aforementioned technologies applied in the project activity are environmentally safe and sound.

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

>>

| **Total Chosen Crediting period (February 2008 to December 2017)** | |
|---|---|
| **Years** | **Annual estimation reductions in tonnes of $CO_2$ e** |
| Year A | 14741 |
| Year B | 14741 |
| Year C | 14741 |
| Year D | 14741 |
| Year E | 14741 |
| Year F | 14741 |
| Year G | 14741 |
| Year H | 14741 |
| Year I | 14741 |
| Year J | 14741 |
| **Total estimated reductions (tonnes of $CO_2$ e)** | 147410 |
| Total number of crediting years | 10 |
| Annual average over the crediting period of estimated reductions (tonnes of $CO_2$ e) | 14741 |

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

>>
Public funding from Annex I and diversion of ODA is not involved in this project.

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

As mentioned under *Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project Activities,* the following results into debundling of large CDM project:

"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; and
- 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 identified CDM project is being promoted by GHCL Ltd.

With reference to aforementioned points of de-bundling, the project activity does not comply with any of the above conditions, therefore, the project activity is considered as small scale CDM 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 small-scale project activity:**

>>
Project has applied approved methodology available for small-scale CDM project at UNFCCC website under Appendix B of the simplified modalities and procedures for small-scale CDM project activities

**Type II:Energy Efficiency Improvement Projects**
**Category IID: Energy efficiency and fuel switching measures for industrial facilities**
**Reference:**
**II.D./Version 10**
**Scope: 4**
**EB33**

**B.2 Justification of the choice of the project category:**

According to the selected methodology for the small scale CDM project the baseline has defined as:
**Type II:Energy Efficiency Improvement Projects**
**Category IID: Energy efficiency and fuel switching measures for industrial facilities**

*This category comprises any energy efficiency and fuel switching measure implemented at a single industrial or mining and mineral production 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 or mining and mineral production 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 applicability of the above mentioned methodology can be explained in the following given arguments:

- The Energy Efficiency and fuel switching measure is being implemented at the single industrial facility; at GHCL Limited, Bhilad.
- This project activity comprises of commissioning and operation of a new energy efficient 5.67 MW gas turbine with Waste heat recovery system for electricity and steam generation at the industrial facility of GHCL Ltd. The project activity will partially replace the use of 1250 KVA DG set and Man B&W DG set (which are having lower thermal efficiency in comparison with Gas Turbine) for electricity generation and partially replace the use of boiler for steam generation. The Man B&W DG set is being fired with Furnace Oil (with HSD being used as start-up fuel). The 1250 KVA DG set being fired with HSD is used only in case of emergency.
- The project activity will replace furnace oil, HSD with the natural gas for electricity generation and also replaces furnace oil with natural gas for steam generation
- The aggregate fuel input saving of the project activity is 20 GWhth.

From the above discussion, it can be concluded that project meets all the applicability criteria set under the selected approved small scale CDM methodology and hence the project category is applicable to the CDM project.

**B.3. Description of the project boundary:**

>>

**Boundary** –According to the selected approved project category the project boundary is the physical, geographical site of the industrial or mining and mineral production facility, processes or equipment that are affected by the project activity.

The Physical boundary in this case consists of the Power Plant and the boiler house at GHCL Limited, Bhilad.

| | Source | Gas | Included? | Justification / Explanation |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| **Baseline Activity** | Fuel Consumption for electricity generation (DG sets) | $CO_2$ | Yes | Main emission source. |
| | | $CH_4$ | No | Excluded for simplification. |
| | | $N_2O$ | No | Excluded for simplification. |
| | Fuel Consumption for steam generation (boilers) | $CO_2$ | Yes | Main emission source. |
| | | $CH_4$ | No | Excluded for simplification. |
| | | $N_2O$ | No | Excluded for simplification. |
| Project Activity | Fuel Consumption for electricity generation | $CO_2$ | Yes | Main emission source. |
| | | $CH_4$ | No | Excluded for simplification. |
| | | $N_2O$ | No | Excluded for simplification. |
| | Fuel Consumption for steam generation ( Boiler) | $CO_2$ | Yes | Main emission source. |
| | | $CH_4$ | No | Excluded for simplification |
| | | $N_2O$ | No | Excluded for simplification |

**B.4. Description of baseline and its development:**

>>
As per the methodology:
Type II D

- In the case of replacement, modification or retrofit measures, the baseline consists of the energy baseline of the existing facility or sub-system that is replaced, modified or retrofitted. In the case of a new facility the energy baseline consists of the facility that would otherwise be built.
- In the absence of the CDM project activity, the existing facility would continue to consume energy (ECbaseline, in GWh/year) at historical average levels (EChistorical, in GWh/year), until the time at which the industrial or mining and mineral production facility would be likely to be replaced, modified or retrofitted in the absence of the CDM project activity (DATEBaselineRetrofit). From that point of time onwards, the baseline scenario is assumed to

correspond to the project activity, and baseline energy consumption (ECbaseline) is assumed to equal project energy consumption (ECy, in GWh/year), and no emission reductions are assumed to occur.

ECbaseline = EChistorical until DATEBaselineRetrofit

ECbaseline = ECy on/after DATEBaselineRetrofit

In order to estimate the point in time when the existing equipment would need to be replaced in the absence of the project activity (DATEBaselineRetrofit), project participants may take the following approaches into account:

(a) The typical average technical lifetime of the equipment type may be determined and documented, taking into account common practices in the sector and country, e.g. based on industry surveys, statistics, technical literature, etc.

(b) The common practices of the responsible industry regarding replacement schedules may be evaluated and documented, e.g. based on historical replacement records for similar equipment. The point in time when the existing equipment would need to be replaced in the absence of the project activity should be chosen in a conservative manner, i.e. if a range is identified, the earliest date should be chosen.

- Each energy form in the emission baseline is multiplied by an emission coefficient (in kg $CO_2$e/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 coefficients may be used.

As per the methodology AMS II D the baseline scenario consists of the energy baseline of the existing facility or sub-system that is replaced, modified or retrofitted. Therefore the baseline scenario is the continuation of the current practice followed by the project proponent for the electricity generation (by the use of 1250 KVA DG set being fired with H.S.D. and Man B&W DG set being fired with Furnace Oil (with HSD being used as a start up fuel)), steam generation (by the Thermax boiler fired by Furnace Oil)

The project activity replaces the use of both the DG sets. The documents related to the technical lifetime of the DG sets would be shown to the DOE to prove that the DG sets remaining technical lifetime will be more than the crediting period of the current project activity.

The project activity aims at GHG reductions into the atmosphere due to increase thermal energy efficiency, decrease in consumption of fossil fuel quantities per output and switch over of fuel to low carbon intensive fuel. In the absence of the project activity the baseline would be consumption of HSD and furnace oil as fuel for power generation and use of furnace oil for steam generation. Therefore the emissions at the baseline are the emissions that would have occurred due to the use of DG sets which is having lower thermal efficiency in comparison with Gas Turbine and burning of the higher GHG intensive fossil fuels i.e. HSD in the DG set engine, and Furnace Oil in DG set engine, boiler.

Type II D

**Baseline Emissions**

**Emission for Electricity Generation**

Emissions from Electricity Generation in Baseline Activity ($E_{GB}$) (tCO2e) = $Q_{FO1} \times NCV_{FO} \times (4.186/10^9) \times EF_{FO}/1000 + (Q_{HSD1} + Q_{HSD2}) \times NCV_{HSD} \times (4.186/10^9) \times EF_{HSD}/1000$

$Q_{FO1}$ Quantity of Furnace Oil consumed in 1250 KVA DG Set (kg)

$NCV_{FO}$ net calorific value of Furnace Oil (kcal/kg)

4.186/10^9 conversion from kcal to TJ

$EF_{FO}$ Emission Factor of Furnace Oil (kgC02/TJ)

$Q_{HSD1}$ Quantity of HSD consumed in 1250 KVA DG Sets (kg)
$Q_{HSD1}$ Quantity of HSD consumed in Man B&W DG Sets (kg)
$NCV_{HSD}$ net calorific value of HSD (kcal/kg)
$EF_{HSD}$ Emission Factor of HSD (kgCO2e/TJ)

$SE_1$ (Specific Emission Factor for Electricity Generation) (tCO2e/MWh) = $E_{GB}$ / ($EG_{DG1}$ + $EG_{DG2}$ )
$EG_{DG1}$ = Electricity generated by 1250KVA DG sets in the baseline scenario (kWh)
$EG_{DG2}$ = Electricity generated by Man B&W DG sets in the baseline scenario (kWh)

**Emission for Steam Generation**
Emissions from Steam Generation in Baseline Activity ($E_{SB}$) (tCO2e) = $Q_{FO2} \times NCV_{FO} \times (4.186/10^9) \times EF_{FO}/1000$
$Q_{FO2}$ Quantity of Furnace Oil consumed in Boilers (kg)
$NCV_{FO}$ net calorific value of Furnace Oil (kcal/kg)
4.186/10^9 conversion from kcal to TJ
$EF_{FO}$ Emission Factor of Furnace Oil (kgCO2e/TJ)
$SE_2$ (Specific Emission Factor for Steam Generation) = $E_{SB}$ / $ST_{B1}$
$ST_{B1}$ (Kg) = Quantity of Steam Generated from Boilers ($ST_{B1}$)

Total Baseline emissions (BE) = SE1 ×$EG_P$ (Electricity generated in Project activity from the Gas turbine) + SE2 × $ST_P$(Steam Generated during the Project Activity (steam from WHRB ($ST_{P1}$) and boiler $ST_{P2}$)

| **Variable** | **Data Source** |
|---|---|
| $Q_{FO1}$ – Quantity of Furnace Oil Consumed in DG Sets | Plant record |
| $Q_{FO2}$ – Quantity of Furnace Oil Consumed in Boiler | Plant Record |
| $EG_{DG1}$ - Electricity generated by 1250 KVA DG set | Plant Record |
| $EG_{DG2}$ – Electricity generated by the Man B&W DG sets | Plant Record |
| $Q_{HSD}$ – Quantity of HSD Consumed in 1250 KVA DG Sets | Plant record |
| $Q_{HSD}$ – Quantity of HSD Consumed in Man B&W DG Set | Plant Record |
| $ST_{B1}$ – Quantity of Steam generated from boiler | Plant Record |
| **Parameter** | **Data Source** |
| $NCV_{FO}$ – Calorific value of Furnace Oil | Supplier Invoice |
| $EF_{FO}$- Emission Factor of Furnace Oil | 2006 IPCC Guidelines for National Greenhouse Gas Inventories Table 1.4 |
| $NCV_{HSD}$ – Calorific value of HSD | Supplier Invoice |
| $EF_{HSD}$- Emission Factor of HSD | IPCC Default Value |

**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:**

As explained above, the project initiative qualifies under Type IID- Energy efficiency and fuel switching measures for industrial facilities. The following paragraph has been detailed on project additionality.

In accordance with article 12 of the Annex II to decision 21/CP .8to use simplified modalities and procedures for small scale CDM project activities, a proposed project activity shall:

- Meet eligibility criteria for small scale CDM project activity set out in paragraph 6(c ) of decision 17/ CP.7
- Confirms to one of the projects categories listed in appendix B to this annex
- Not be a debundled component of a larger project activity as determined through appendix C to this annex

The CDM project activity complies with all the above criteria set for small scale project activities.

For the selected type and category, the appendix B of the simplified modalities and procedures for small scale CDM project activities offers an indicative baseline methodology

In accordance with simplified modalities and procedures for small-scale Clean Development Mechanism (CDM) project activities, a simplified baseline and monitoring methodology listed in Appendix B may be used if project participants can demonstrate 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. Similarly, for the identified CDM project, following barriers have been overcome during project planning and execution:

**Investment Barrier:**
The baseline scenario is FO based electricity and steam generation. The baseline alternative (FO based electricity and steam generation) are compared with the project activity using NPV of the cash flows for the 15 years.

Investment appraisal decision for the project activity was based on the cash flow which is derived due to difference on cost per unit of electricity generation and investment for the project activity. Accordingly cost incurred for electricity and steam generation was compared with the baseline activity. The cash flow for the crediting periods are discounted and presented. The financial indicator finally chosen was NPV which was calculated for difference cashflow for both the scenarios (project activity and baseline scenario) by the project proponent for electricity generation and steam generation for a period of 10 years.

Both the NPV and IRR methods are discounted cash flow methods, although NPV is theoretically preferable.

The financial analysis conducted showed the economic infeasibility of the initiative. Converting from FO to Natural gas required GHCL Limited to make huge investments in new equipments as well as infrastructure. The additional investments for switch over to natural gas implied that the project would not be cost effective. It is important to understand the figures were estimated considering projections carried out by GHCL at the time the project was being considered. The analysis shows it was not an attractive investment. Without the expectation of this project being a CDM, the investment would not have happened. Carbon Revenues were envisaged to reduce the deficit.

The assumptions taken for the financial analysis are:

1. Natural Gas price for the first year is taken as 12.8 INR/$sm^3$ and that of Furnace Oil in the first year is taken as 15 INR/lt
2. Total operating hours of the plant in case of baseline scenario is taken as 8200 in the first year and for the next 15 years its taken as 8400. The operating hours in project activity scenario is assumed as 8400 every year for 15 years.
3. the interest rate for the project activity is 9%
4. the cost for the Natural Gas based project activity is taken as INR 175 Millions
5. Escalation rate is taken as 4% in both the baseline scenario and project activity.
6. 100% of the project is financed by bank with the rate of interest for the bank is taken at 9% and the repayment of loan to be 60 Quarterly installments.
7. the price of CER's is taken as 14 Euros per CER.
8. The exchange rate is taken as 57 INR per 1 Euro.

The cost per unit of generation in case of baseline scenario is calculated as per the actual for operating the 3.6 MW DG set and the cost per unit generation in case of the project activity is based on the estimates for operating the 5.67 MW Gas Turbine.

It is important to understand the figures were assumed figures. NPV analysis is carried out to assess the attractiveness of the project activity in comparison to baseline scenario. Negative NPV indicates that the baseline scenario is economically more feasible than the project activity and investing in Natural Gas for power and steam generation is not an economically attractive option.

| **Discount rate** | **7.5%** | **8%** | **9%** | **10%** |
|---|---|---|---|---|
| | Millions | | | |
| **NPV of FO vs Natural Gas (without CER)** | (64.2) | (63.1) | (60.9) | (58.9) |
| **NPV of FO vs Natural Gas (with CER) at 14 Euros per CER** | 34.4 | 32.5 | 29.1 | 26.1 |

Sensitivity analysis has been done to find the change in discount rate on NPV of the project activity. The risks on plant load factor remains outside the control of sensitivity analysis, and it assumes as same in all the scenarios. From the below analysis it is apparent that there is significant risk associated with the project activity that impacts the viability of the project as highlighted through the sensitivity analysis.

As it can bee seen from the above figures that NPV is negative which concludes that the use of natural gas for power and steam generation is not an economically attractive option.

Without the expectation of this project being a CDM, the investment for the natural gas would not have happened. Credits from GHG emission reductions are envisaged to reduce the deficit.

**Other Barriers**

- Upgrading the skill sets of man power to handle the newly installed gas engines was another activity that needed to be initiated once the decision to install Gas engine and Gas turbine was taken.

Thus from the above discussion it can be concluded that the project activity has to over come the barriers and is not a business as usual scenario.

## B.6. Emission reductions:

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

In the absence of the project activity the baseline would be consumption of furnace oil as fuel for electricity, heat, and steam generation and consumption of HSD for electricity generation.

**Baseline Emissions**
**Emission for Electricity Generation**

Emissions from Electricity Generation in Baseline Activity ($E_{GB}$) (tCO2e) = $Q_{FO1} \times NCV_{FO} \times (4.186/10^9) \times EF_{FO}/1000 + (Q_{HSD1} + Q_{HSD2}) \times NCV_{HSD} \times (4.186/10^9) \times EF_{HSD}/1000$

$Q_{FO1}$ Quantity of Furnace Oil consumed in 1250 KVA DG Set (kg)
$NCV_{FO}$ net calorific value of Furnace Oil (kcal/kg)
4.186/10^9 conversion from kcal to TJ
$EF_{FO}$ Emission Factor of Furnace Oil (kgC02/GJ)
$Q_{HSD1}$ Quantity of HSD consumed in 1250 KVA DG Sets (kg)
$Q_{HSD1}$ Quantity of HSD consumed in Man B&W DG Sets (kg)
$NCV_{HSD}$ net calorific value of HSD (kcal/kg)
$EF_{HSD}$ Emission Factor of HSD (kgCO2e/GJ)

$SE_1$ (Specific Emission Factor for Electricity Generation) (tCO2e/MWh) = $E_{GB} / (EG_{DG1} + EG_{DG2})$
$EG_{DG1}$ = Electricity generated by 1250KVA DG sets in the baseline scenario (MWh)
$EG_{DG2}$ = Electricity generated by Man B&W DG sets in the baseline scenario (MWh)

**Emission for Steam Generation**

Emissions from Steam Generation in Baseline Activity ($E_{SB}$) (tCO2e) = $Q_{FO2} \times NCV_{FO} \times (4.186/10^9) \times EF_{FO}/1000$

$Q_{FO2}$ Quantity of Furnace Oil consumed in Boilers kg)
$NCV_{FO}$ net calorific value of Furnace Oil (kcal/kg)
4.186/10^9 conversion from kcal to TJ
$EF_{FO}$ Emission Factor of Furnace Oil (kgCO2e/GJ)
$SE_2$ (Specific Emission Factor for Steam Generation) = $E_{SB} / ST_{B1}$
$ST_{B1}$ (Kg) = Quantity of Steam Generated from Boilers ($ST_{B1}$)

Total Baseline emissions (BE) = SE1 $\times EG_P$ (Electricity generated in Project activity from the Gas turbine) + SE2 $\times ST_P$(Steam Generated during the Project Activity (steam from WHRB ($ST_{P1}$) and boiler $ST_{P2}$)

**Project Emissions**

Emissions from Electricity Generation in Project Activity ($E_{GP}$) (tCO2e) =
($Q_{NG1}$)× $NCV_{NG}$×(4.186/10^9)×$EF_{NG}$ /1000
$Q_{NG1}$ Quantity of Natural Gas consumed in Gas Turbine ($sm^3$)
$NCV_{NG}$ net calorific value of Natural Gas (kcal/$sm^3$)
4.186/10^9 conversion from kcal to TJ
$EF_{NG}$ Emission Factor of Natural Gas(kgCO2e/GJ)

The SM thermax boiler would be hooked up with NG and would be used as the stand by as and when the steam generated by the WHRS is not sufficient to meet the requirements. The quantity of the Natural Gas thus consumed would be measured ex-post and the project emissions due to the firing of the natural gas would be calculated as described below.

Emissions from Steam Generation in Project Activity ($E_{SP}$) (tCO2e) = ($Q_{NG3}$ + $Q_{NG2}$) × $NCV_{NG}$ × (4.186/10^9) × $EF_{NG}$ /1000
$Q_{NG2}$ Quantity of natural gas consumed in the Boiler ($sm^3$)
$Q_{NG3}$ Quantity of natural gas consumed in the WHRS ($sm^3$)
$NCV_{NG}$ net calorific value of Natural gas (kcal/$sm^3$)
4.186/10^9 conversion from kcal to TJ
$EF_{NG}$ Emission Factor of Natural Gas(tC/TJ)
$OXID_{NG}$ Oxidation factor of natural gas
4.186/10^9 conversion from kcal to TJ
$EF_{FO}$ Emission Factor of Furnace Oil (KgCO2e/GJ)
$OXID_{FO}$ Oxidation factor of furnace oil

Project Emissions (PE) = $E_{GP}$ + $E_{SP}$

**Leakage**
As per the methodology AMS II D If the energy efficiency technology is equipment transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.
As the equipment is not transferred to another activity, the leakage need not be considered.

Emissions Reductions = Baseline Emissions (BE) – Project Emissions (PE) – Leakage (L)

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

*(Copy this table for each data and parameter)*

| **Data / Parameter:** | **$EG_{DG1}$** |
|---|---|
| Data unit: | kWh |
| Description: | Electricity generated by 1250 KVA DG set during the baseline activity |
| Source of data used: | The meter is a 3 phase 4 wire static watthour meter of L&T make. The model is EM301 and the accuracy is of class 1. the data is recorded in Power Plant log Book |
| Value applied: | 90880 |

| | |
|---|---|
| Justification of the choice of data or description of measurement methods and procedures actually applied : | It is measured on continuous basis using the static watthour meter. Shift Engineer will take the readings every 24 hours and the readings are recorded in log book and MIS by the senior manager. |
| Any comment: | |

| **Data / Parameter:** | **$EG_{DG2}$** |
|---|---|
| Data unit: | kWh |
| Description: | Electricity generated by Man B&W DG set during the baseline activity |
| Source of data used: | The meter is of the type Digital Energy meter (E3V055-3 PHASE,3 WIRE) of Security meters make. The accuracy class is 0.5. the data is recorded in Night Report Log Book. |
| Value applied: | 17688154 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | It is measured on continuous basis using the online energy meter. Shift Engineers will take readings every 24 hours and the readings are recorded in the log book and MIS |
| Any comment: | |

| **Data / Parameter:** | $Q_{FO1}$ |
|---|---|
| Data unit: | Kg |
| Description: | Quantity of Furnace oil consumed in Man B&W DG Set in the baseline |
| Source of data used: | The meter is of Contoil make of model V20 20FL 130 / 25-RV 1. the data is recorded in Power Plant Log Book |
| Value applied: | 4166098 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | the quantity of the furnace oil consumed is measured on a continuous basis as an online meter is installed. The shift engineers record the data every 24 hours and the readings are recorded in the log book the senior manager checks the readings and prepares the MIS |
| Any comment: | measured on a continuous basis. |

| **Data / Parameter:** | $Q_{FO2}$ |
|---|---|
| Data unit: | Kg |
| Description: | Quantity of Furnace oil consumed in boiler in the baseline |
| Source of data used: | The mass flow sensor of the meter is of Micro Motion make and the model number is R100S128NCAMEZZZZ. The transmitter is of Micro Motion make of model number 1700111ABFEZZZ. The data is recorded in Boiler log Book |
| Value applied: | 2871532 |
| Justification of the choice of data or description of | the quantity of the furnace oil consumed is measured on a continuous basis as an online meter is installed. The readings are taken by the shift operator every 24 hours and enter them in the log book. They are cross checked by the senior |

| | |
|---|---|
| measurement methods and procedures actually applied : | manager and then entered into the MIS |
| Any comment: | measured on a continuous basis. |

| **Data / Parameter:** | $Q_{HSD1}$ |
|---|---|
| Data unit: | L |
| Description: | Quantity of HSD consumed in Man B&W DG Set in the baseline |
| Source of data used: | Powerplant Log Book |
| Value applied: | 39515 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The measurement is done using the dip stick method. The Man B&W DG is fired with HSD as a start up fuel after the maintenance is done. The Man B&W DG has a separate Fuel tank. In case of maintenance the level of the tank before the use of HSD is measured and at the end of the day the level is measured. The level difference is then converted to the quantity of HSD consumed in litres. |
| Any comment: | |

| **Data / Parameter:** | $Q_{HSD2}$ |
|---|---|
| Data unit: | L |
| Description: | Quantity of HSD consumed in 1250 KVA DG Set in the baseline |
| Source of data used: | Power Plant Log Book |
| Value applied: | 26630 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The measurement is done by dip stick. The 1250 KVA DG set has a separate fuel tank. This DG is used only in case of emergency and the measurement of HSD is made only when the DG is used. For the days where 1250 KVA Dg is use the level of the tank before the use of HSD is measured and at the end of the day the level is measured. The level difference is then converted to the quantity of HSD consumed in litres. |
| Any comment: | |

| **Data / Parameter:** | $ST_{B1}$ |
|---|---|
| Data unit: | KG |
| Description: | Steam generated from Boiler during the baseline activity |
| Source of data used: | The meter is of the Rosemount make. The data is recorded in boiler log book. |
| Value applied: | 41876637 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | It is measured on a continuous basis using the online flow meter and is recorded on a daily basis by shift operator. The senior manager cross checks the readings and enters then in the MIS |
| Any comment: | Is measured daily using the flow meter |

| **Data / Parameter:** | $NCV_{FO}$ |
|---|---|

| | |
|---|---|
| Data unit: | kcal/kg |
| Description: | Net Calorific Value of Furnace Oil |
| Source of data used: | Supplier Invoice |
| Value applied: | 9641 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | |
| Any comment: | |
| Data / Parameter: | $NCV_{HSD}$ |
| Data unit: | kcal/kg |
| Description: | Net Calorific Value of HSD |
| Source of data used: | Plant Data |
| Value applied: | 9200 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | |
| Any comment: | |

| | |
|---|---|
| Data / Parameter: | $EF_{HSD}$ |
| Data unit: | kgCO2e/GJ |
| Description: | Emission Factor of HSD |
| Source of data used: | 2006 IPCC Guidelines for National Greenhouse Gas Inventories Table 1.4 |
| Value applied: | 74100 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | IPCC default value. |
| Any comment: | IPCC Default Value |

| | |
|---|---|
| **Data / Parameter:** | $EF_{FO}$ |
| Data unit: | kgCO2e/GJ |
| Description: | Emission Factor of Furnace Oil |
| Source of data used: | 2006 IPCC Guidelines for National Greenhouse Gas Inventories Table 1.4 |
| Value applied: | 77400 |
| Justification of the choice of data or description of measurement methods and procedures actually | IPCC default value. |

| | |
|---|---|
| applied : | |
| Any comment: | IPCC Default Value |

| | |
|---|---|
| Data / Parameter: | $EF_{NG}$ |
| Data unit: | kgCO2e/GJ |
| Description: | Emission Factor of Natural Gas |
| Source of data used: | 2006 IPCC Guidelines for National Greenhouse Gas Inventories Table 1.4 |
| Value applied: | 56100 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | IPCC default value. |
| Any comment: | IPCC Default Value |

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

**Baseline Emissions**

**Emission for Electricity Generation**

Emissions from Electricity Generation in Baseline Activity ($E_{GB}$) (tCO2e) = $Q_{FO1} \times NCV_{FO} \times (4.186/10\text{^}9) \times EF_{FO} /1000 + (Q_{HSD1} + Q_{HSD2}) \times NCV_{HSD} \times (4.186/10\text{^}9) \times EF_{HSD} /1000$

$Q_{FO1}$ Quantity of Furnace Oil consumed in 1250 KVA DG Set (kg)

$NCV_{FO}$ net calorific value of Furnace Oil (kcal/kg)

4.186/10^9 conversion from kcal to TJ

$EF_{FO}$ Emission Factor of Furnace Oil (kgC02/GJ)

$Q_{HSD1}$ Quantity of HSD consumed in 1250 KVA DG Sets (kg)

$Q_{HSD1}$ Quantity of HSD consumed in Man B&W DG Sets (kg)

$NCV_{HSD}$ net calorific value of HSD (kcal/kg)

$EF_{HSD}$ Emission Factor of HSD (kgCO2e/GJ)

$SE_1$ (Specific Emission Factor for Electricity Generation) (tCO2e/MWh) = $E_{GB} / (EG_{DG1} + EG_{DG2})$

$EG_{DG1}$ = Electricity generated by 1250KVA DG sets in the baseline scenario (MWh)

$EG_{DG2}$ = Electricity generated by Man B&W DG sets in the baseline scenario (MWh)

$E_{GB}$ (tCO2e) = 4166098× 9641 × (4.186/10^9) × 77400 /1000 + 6614 × 9200 × (4.186/10^9) × 74100 /1000 = 13169.53

$SE_1$ (tCO2e/kWh) = 13169.53 / 17779034 = 0.000740734

**Emission for Steam Generation**

Emissions from Steam Generation in Baseline Activity ($E_{SB}$) (tCO2e) = $Q_{FO2} \times NCV_{FO} \times (4.186/10\text{^}9) \times EF_{FO} /1000$

$Q_{FO2}$ Quantity of Furnace Oil consumed in Boilers kg)

$NCV_{FO}$ net calorific value of Furnace Oil (kcal/kg)

4.186/10^9 conversion from kcal to TJ

$EF_{FO}$ Emission Factor of Furnace Oil (kgCO2e/GJ)

$SE_2$ (Specific Emission Factor for Steam Generation) = $E_{SB}$ / $ST_{B1}$
$ST_{B1}$ (Kg) = Quantity of Steam Generated from Boilers ($ST_{B1}$)

$E_{SB}$ (tCO2e) = 2871532× 9641×(4.186/10^9)×7740 /1000 = 8969

$SE_2$ = 8969/41876637 = 0.00021419

Total Baseline emissions (BE) = SE1 ×$EG_P$ (Electricity generated in Project activity from the Gas turbine) + SE2 × $ST_P$(Steam Generated during the Project Activity (steam from WHRB ($ST_{P1}$) and boiler $ST_{P2}$) .

BE (tCO2e) = 0.000740734 ×28320000 + 0.00021419 × 84960000 = 39175

| Year | BEy (tCO2e) |
|---|---|
| Year A | 39175 |
| Year B | 39175 |
| Year C | 39175 |
| Year D | 39175 |
| Year E | 39175 |
| Year F | 39175 |
| Year G | 39175 |
| Year H | 39175 |
| Year I | 39175 |
| Year J | 39175 |

**Project Emissions**

Emissions from Electricity Generation in Project Activity ($E_{GP}$) (tCO2e) = ($Q_{NG1}$) × $NCV_{NG}$ × (4.186/10^9) × $EF_{NG}$ / 1000
$Q_{NG1}$ Quantity of Natural Gas consumed in Gas Turbine ($sm^3$)
$NCV_{NG}$ net calorific value of Natural Gas ($kcal/sm^3$)
4.186/10^9 conversion from kcal to TJ
$EF_{NG}$ Emission Factor of Natural Gas(kgCO2e/GJ)

$E_{GP}$ (tCO2e) = 10620000 × 8350 × (4.186/10^9) × 56100/1000 = 3609.56

The SM thermax boiler would be hooked up with NG and would be used as the stand by as and when the steam generated by the WHRS is not sufficient to meet the requirements. The quantity of the Natural Gas thus consumed would be measured ex-post and the project emissions due to the firing of the natural gas would be calculated as described below.

Emissions from Steam Generation in Project Activity ($E_{SP}$) (tCO2e) = ($Q_{NG3}$ + $Q_{NG2}$) × $NCV_{NG}$ × (4.186/10^9) × $EF_{NG}$ /1000
$Q_{NG2}$ Quantity of natural gas consumed in the Boiler ($sm^3$)

$Q_{NG3}$ Quantity of natural gas consumed in the WHRS ($sm^3$)
$NCV_{NG}$ net calorific value of Natural gas ($kcal/sm^3$)
4.186/10^9 conversion from kcal to TJ
$EF_{NG}$ Emission Factor of Natural Gas(tC/TJ)
$OXID_{NG}$ Oxidation factor of natural gas
4.186/10^9 conversion from kcal to TJ
$EF_{FO}$ Emission Factor of Furnace Oil (KgCO2e/GJ)
$OXID_{FO}$ Oxidation factor of furnace oil
($E_{SP}$) (tCO2e) = 1840800 × 8350 × (4.186/10^9) × 56100 / 1000 = 20977.57

Project Emissions (PE) (tCO2e) = $E_{GP}$ + $E_{SP}$ = 24434 (tCO2e)

| Year | PEy (tCO2e) |
|---|---|
| Year A | 24434 |
| Year B | 24434 |
| Year C | 24434 |
| Year D | 24434 |
| Year E | 24434 |
| Year F | 24434 |
| Year G | 24434 |
| Year H | 24434 |
| Year I | 24434 |
| Year J | 24434 |

**Leakage**
As per the methodology AMS II D If the energy efficiency technology is equipment transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.
As the equipment is not transferred to another activity, the leakage need not be considered.

**B.6.4 Summary of the ex-ante estimation of emission reductions:**
>>
Emissions Reductions = Baseline Emissions (BE) – Project Emissions (PE) – Leakage (L)

| Year | Estimation of Project activity emissions ($tCO_2e$) | Estimation of baseline emissions ($tCO_2e$) | Estimation of leakage ($tCO_2e$) | Estimation of overall emission reductions ($tCO_2e$) |
|---|---|---|---|---|
| | t CO2 | t CO2 | | t CO2 |
| Year A | 24434 | 39175 | 0 | 14741 |
| Year B | 24434 | 39175 | 0 | 14741 |
| Year C | 24434 | 39175 | 0 | 14741 |
| Year D | 24434 | 39175 | 0 | 14741 |

| | | | | |
|---|---|---|---|---|
| Year E | 24434 | 39175 | 0 | 14741 |
| Year F | 24434 | 39175 | 0 | 14741 |
| Year G | 24434 | 39175 | 0 | 14741 |
| Year H | 24434 | 39175 | 0 | 14741 |
| Year I | 24434 | 39175 | 0 | 14741 |
| Year J | 24434 | 39175 | 0 | 14741 |
| Total (tonnes of CO2e) | 244340 | 391750 | 0 | 147410 |

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

As per the AMS II D for the project activity monitoring shall consist of:
(a) Documenting the specifications of the equipment replaced;
(b) Metering the energy use of the industrial or mining and mineral production facility, processes or the equipment affected by the project activity;
(c) Calculating the energy savings using the metered energy obtained from subparagraph (b).

### B.7.1 Data and parameters monitored:

| **Data / Parameter:** | **$EG_P$** |
|---|---|
| Data unit: | kWh |
| Description: | Electricity Generated during the project activity from the Gas turbine |
| Source of data to be used: | The meter that will be installed is electronic meter calibrated by Gujarat Electricity Board. The data will be stored in the Power Plant log book. |
| Value of data | 28320000 |
| Description of measurement methods and procedures to be applied: | The electricity generated will be measured using the online meter on continuous basis. The shift engineers will record the data on daily basis. Shift Engineers will take readings every 24 hours and the readings are recorded in the log book. Senior Manager checks the data and enters it in the MIS |
| QA/QC procedures to be applied: | Internal Quality Control and Quality Assurance procedures will be followed where the General Manager (Power Plant) will check the data that the Senior Manager enters in the MIS on a daily basis. |
| Any comment: | |

| **Data / Parameter:** | **$Q_{NG1}$** |
|---|---|
| Data unit: | SCM |
| Description: | Quantity of NG consumed in Gas Turbine |
| Source of data to be used: | The meter that will be installed is RPD type meter of Turbomach make. The data will be stored in Power Plant Log Book |
| Value of data | 10620000 |
| Description of measurement methods and procedures to be applied: | The quantity of NG used will be measured using the RPD type meter on a daily basis. The data will be recorded by shift engineers every 24 hours and the readings are recorded in the log book. The senior manager will check the data and enter it in the MIS. |
| QA/QC procedures to | Internal Quality Control and Quality Assurance procedures will be followed |

| | |
|---|---|
| be applied: | where the General Manager (Power Plant) will check the data that the Senior Manager enters in the MIS on a daily basis. |
| Any comment: | |

| **Data / Parameter:** | **$Q_{NG2}$** |
|---|---|
| Data unit: | SCM |
| Description: | Quantity of NG consumed in Boiler |
| Source of data to be used: | The meter that will be installed is RPD type meter of Turbomach make. The data will be stored in Boiler Log Book |
| Value of data | 0 |
| Description of measurement methods and procedures to be applied: | The quantity of NG used will be measured using the RPD type meter on a daily basis. The data will be recorded by shift operators every 24 hours and the readings will be recorded in the log book. The senior manager will check the data and enters it in the MIS. |
| QA/QC procedures to be applied: | Internal Quality Control and Quality Assurance procedures will be followed where the General Manager (Power Plant) will check the data that the Senior Manager enters in the MIS on a daily basis. |
| Any comment: | |

| **Data / Parameter:** | **$Q_{NG3}$** |
|---|---|
| Data unit: | SCM |
| Description: | Quantity of NG consumed in WHRS |
| Source of data to be used: | The meter that will be installed is RPD type meter of Turbomach make. The data will be stored in Power Plant Log Book |
| Value of data | 1840800 |
| Description of measurement methods and procedures to be applied: | The quantity of NG used will be measured using the RPD type meter on a daily basis. The data will be recorded by shift operators every 24 hours and the readings will be recorded in the log book. The senior manager will check the data and enters it in the MIS. |
| QA/QC procedures to be applied: | Internal Quality Control and Quality Assurance procedures will be followed where the General Manager (Power Plant) will check the data that the Senior Manager enters in the MIS on a daily basis. |
| Any comment: | |

| **Data / Parameter:** | **$ST_{P1}$** |
|---|---|
| Data unit: | Tons |
| Description: | Amount of steam generated from WHRB |
| Source of data to be used: | The meter that will be installed is Rosemount Emerson make steam flow meter. The data will be stored in Boiler Plant Log Book |
| Value of data | 84960000 |
| Description of measurement methods and procedures to be | It is measured on a continuous basis using the online flow meter and is recorded on a daily basis by shift operator. The senior manager cross checks the readings and enters then in the MIS |

| | |
|---|---|
| applied: | |
| QA/QC procedures to be applied: | Internal Quality Control and Quality Assurance procedures will be followed where the General Manager (Power Plant) will check the data that the Senior Manager enters in the MIS on a daily basis. |
| Any comment: | |

| **Data / Parameter:** | **$ST_{P2}$** |
|---|---|
| Data unit: | Tons |
| Description: | Amount of steam generated from boiler |
| Source of data to be used: | Boiler Log Book |
| Value of data | 0 |
| Description of measurement methods and procedures to be applied: | Internal Quality Control and Quality Assurance procedures will be followed where the General Manager (Power Plant) will check the data that the Senior Manager enters in the MIS on a daily basis. |
| QA/QC procedures to be applied: | As per the ISO 9000/ ISO 14001 procedures |
| Any comment: | |

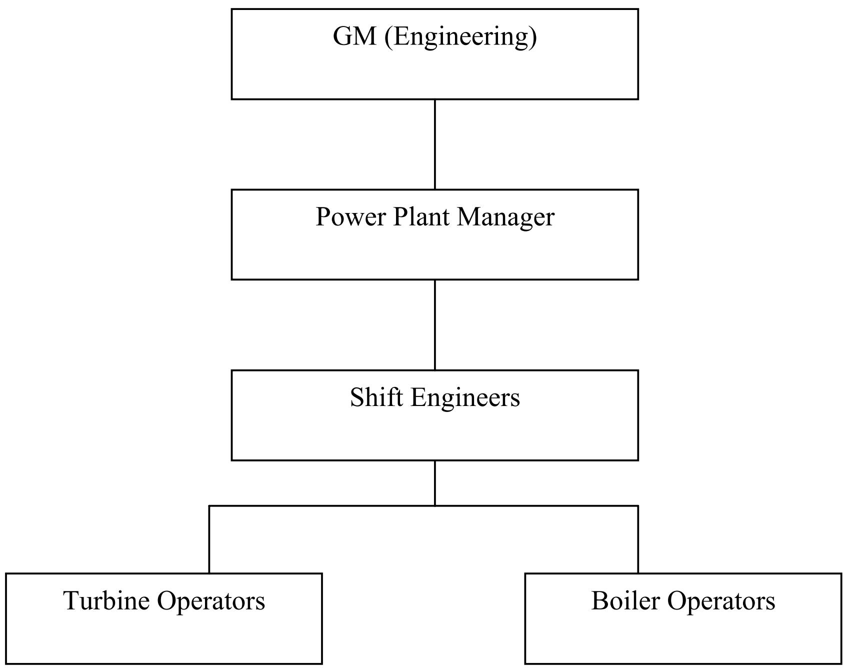
| **Data / Parameter:** | **$NCV_{NG}$** |
|---|---|
| Data unit: | Kcal/SCM |
| Description: | Net Calorific Value of Natural Gas |
| Source of data to be used: | Invoice from suppliers |
| Value of data | 8350 |
| Description of measurement methods and procedures to be applied: | Supplier |
| QA/QC procedures to be applied: | |
| Any comment: | |

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

>>

The project activity is operated and managed by the project proponent. The individual plant record data related to their respective project activity. The natural gas based power project abides and will abide by all regulatory and statutory requirements as prescribed under the state and central laws and regulations. A CDM project team has been constructed at the plant site. The project team has entrusted with the responsibility of storing, recording the data related to the project activity. The project team is also responsible for calculation of actual creditable emission reduction in the most transparent and relevant manner. Installed meters are calibrated according to the maintenance schedule programmed at the start of the operation and recalibrated according the plants performance requirement. All the monitoring data is /will be stored, recorded and kept under safe custody of the (GM Engineering) at the plant site. Also any change within the project boundary, such as change in spare and or equipments will be recorded and any change in the emission reduction due to such alteration will also be studied and recorded. All the data will be stored for a period of Crediting Period + 2 years.

PROJECT TEAM




| **Designation** | **Responsibilities** |
|---|---|
| **Project Head** | Registration<br>Project Execution |
| **G. M. – Engineering** | Operation<br>Verification of data<br>Inspection of data whenever necessary to independently check the authenticity of data and take corrective actions wherever required.<br>Storage of data |
| **Power Plant Manager** | Operation, Monitoring and Verification of Data<br>Storage of data in MIS |
| **Shift Engineers** | Operation and Maintenance<br>Storage of data in Log Book<br>Data Recording |
| Turbine and Boiler Operators | Operation and Maintenance |

Data Recording
Data Collection
Archiving of data

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

GHCL Ltd and CantorCO2e India Private Limited

**Date of completing the final draft of this baseline section *(DD/MM/YYYY)*:** 16/10/2007

## 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:

>>

15/03/2007

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

>>

15 years

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

Fixed Crediting Period

#### C.2.1. Renewable crediting period

NA

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

>>

NA

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

>>

NA

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

10 years

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

01/02/2008 or a date not earlier than the Date of Registration

##### C.2.2.2. Length:

>>

10 years 0 months

## SECTION D. Environmental impacts

>>

### D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

>>

The Environmental Impact Assessment is not required by the Environmental Impact Assessment notification under Environment Protection Act 1986 (Government of India) for the small scale project and hence not conducted as per the requirement of guidelines there under. However a rapid environmental impact assessment was conducted by third party for GHCL Limited, as a voluntary initiative to understand the impacts and mitigate any additional impacts that may arise due to the proposed project activity.

The environmental Impact Assessment study showed that overall environmental impacts are not significant. A summary of impacts is presented below:

Land use

There would be no change in the impact on the land as the project activity will be located in the power plant and the boiler house of the project proponent.

Air quality

the project activity would reduce the major air pollutants such as SOx, NOx and SPM drastically in comparison to the baseline scenario.

Liquid Effluent generation

The liquid effluent generation would decrease as there is a fuel switch from liquid fossil fuel to gaseous fossil fuel.

Noise Levels

The proposed project activity will have no major noise producing sources hence noise pollution is not seen as a problem for the project activity.

Solid Waste Generation

Tank bottom sludge is not expected to be there in the case of Natural gas, in comparison to FO. Accordingly, the solid waste generation is expected to reduce in the case of Natural Gas.

Surface Water and Ground Water.

The studies revealed that all the parameters for samples tested are well within the desirable limits as per IS:10500:1991.

Flora and Fauna

The project activity doesn't contribute to the impacts of ecology – flora and fauna.

Employment

GHCL limited will be needing manpower to manage the running and maintainace of the plant. Thus gainful employment opportunities will be created for the educated / skilled manpower of the region.

**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:**

>>

Only positive impacts are expected, such as reduction in the major air pollutants in the atmosphere, and GHG emission reductions into the atmosphere.The environmental impacts are considered not significant by the project participants.

## SECTION E. Stakeholders' comments

>>

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

>>

GHCL conducted the local stakeholder meeting for the project activity on 2nd August 2007 at GHCL Limited, Bhilad. The project proponent identified the employees, local villagers, suppliers, distributors, govt. officials and near by industry people as the most important stakeholders. The stakeholders thus identified were informed about the stakeholder meeting well in advance and also notices were displayed at key places.

Comments of stakeholders were recorded during the stakeholder meeting.

The stake holder meeting process is followed in the following sequence

- Election of the Chair of the meeting and approval of the proposed Agenda
- Presentation of the CDM-Kyoto Protocol and role of local stake holder
- Presentation of the Projects undertaken at GHCL Ltd.
- Discussion and Articulation of concerns
- Chair summarizing the local stake holder concerns
- Vote of Thanks followed by Tea

The local stakeholder meeting started with Mr. Rupesh Mundhra (DGM, Finance and commercial) welcoming the guests and briefing about the intention of the meeting. Then Mr. Manojbhai Bhikubhai Warli (Sarpanch, Bhilad Village) was elected to chair the meeting. Mr. Rupesh then got the approval of the agenda of the meeting from the chairman.
On the request of Mr. Rupesh, Mr. Sandeep Kota started the presentation with a brief introduction on the Global Warming and Kyoto Protocol. This was followed by the importance of the conducting the stakeholder meeting.
This was translated into the local Gujarati language by Mr. R.D. Purohit.
Mr. M.L. Kashodan (G.M. Engineering) then explained the details of the project activity.

After the presentation was completed, Mr. Rupesh opened the session for stakeholders to articulate their queries, comments and suggestions. The participants sought clarifications on Kyoto Protocol and Clean Development Mechanisms process.
At the end the chairman in his speech appreciated the CDM initiatives and applauded the effort towards cleaner energy.

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

>>

The specific concerns expressed by the participants are summarized below along with clarifications provided on such concerns:

| Stakeholder concerns / question / comment | Answer / clarifications |
|---|---|
| | |
| When will you start firing the Natural Gas in the Gas Turbine | The Gas would be fired in the month of September in the Gas Turbine |
| Are there any new employment opportunities due to the project activity? | Close to 8 new jobs in various capacities will been generated due to the project activity |
| Why is Natural Gas a cleaner fuel? | Natural Gas emits less amount of Greenhouse Gases into the atmosphere in comparison with Furnace Oil. Also there will not be any liquid effluents due to the firing of Natural Gas. |
| Please explain the process of CDM in brief. | The process was elaborated in English, Hindi and Gujrathi to the satisfaction of the stakeholders present |
| What is the total investment for the project | The rough estimate of the investment for Gas Turbine and WHRB is around 16 Crores |

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

>>

The stakeholders were provided clarifications on the issues raised as above to their satisfaction. None of the concerns expressed by the stakeholders required an action to be taken by the GHCL Limited during the project operation and at any other stage.

## Annex 1

### CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

| | |
|---|---|
| Organization: | GHCL Limited |
| Street/P.O.Box: | 191/192 |
| Building: | Mahala Falia, Bhilad |
| City: | Dist : Valsad |
| State/Region: | Gujarat |
| Postfix/ZIP: | 396105 |
| Country: | India |
| Telephone: | +91-260-3983100 |
| FAX: | +91-260-3983200 |
| E-Mail: | rupesh@ghcl.co.in |
| URL: | |
| Represented by: | |
| Title: | Dy. General Manager (Finance & Commercial) |
| Salutation: | Mr. |
| Last Name: | Mundhra |
| Middle Name: | |
| First Name: | Rupesh |
| Department: | Finance & Commercial |
| Mobile: | +91-9328583100 |
| Direct FAX: | +91-260-3983200 |
| Direct tel: | +91-260-3983100 |
| Personal E-Mail: | |

| | |
|---|---|
| Organization: | Cantor Fitzgerald Europe |
| Street/P.O.Box: | 17 Crosswall |
| Building: | |
| City: | London |
| State/Region: | |
| Postfix/ZIP: | EC3N 2LB |
| Country: | United Kingdom |
| Telephone: | +44 207 894 7000 |
| FAX: | +44207 894 7553 |
| E-Mail: | msnelling@cantor.co.uk |
| URL: | www.cantor.co.uk |
| Represented by: | |
| Title: | Director Legal (Europe and Asia) and Company Secretary |
| Salutation: | Mr |
| Last Name: | Snelling |

| | |
|---|---|
| Middle Name: | |
| First Name: | Mark |
| Department: | Legal |
| Mobile: | |
| Direct FAX: | +44207 894 7553 |
| Direct tel: | +44 207 94 7892 |
| Personal E-Mail: | |

## Annex 2

### INFORMATION REGARDING PUBLIC FUNDING

No Public Funding is involved in the Project Activity.

## Annex 3

## BASELINE INFORMATION

| Variable | Data Source |
|---|---|
| $Q_{FO1}$ – Quantity of Furnace Oil Consumed in DG Sets | Plant record |
| $Q_{FO2}$ – Quantity of Furnace Oil Consumed in Boiler | Plant Record |
| $Q_{FO3}$ – Quantity of Furnace Oil Consumed in Thermopac | Plant Record |
| $EG_{DG1}$ - Electricity generated by 1250 KVA DG set | Plant Record |
| $EG_{DG2}$ – Electricity generated by the Man B&W DG sets | Plant Record |
| $Q_{HSD}$ – Quantity of HSD Consumed in 1250 KVA DG Sets | Plant record |
| $Q_{HSD}$ – Quantity of HSD Consumed in Man B&W DG set | Plant Record |
| $ST_{B1}$ – Quantity of Steam generated from boiler | Plant Record |
| **Parameter** | **Data Source** |
| $NCV_{FO}$ – Calorific value of Furnace Oil | IPCC Default value |
| $EF_{FO}$- Emission Factor of Furnace Oil | IPCC Default Value |
| $NCV_{HSD}$ – Calorific value of HSD | IPCC Default value |
| $EF_{HSD}$- Emission Factor of HSD | IPCC Default Value |

**Total Baseline Emissions from Steam Generation**

| Year | Steam gen of Boiler(Kg) | FO cons of Boiler (KG) | NCV (Kcal/Kg) | EF(kgCo2/TJ) | Emissions(tCO2) |
|---|---|---|---|---|---|
| June'06-Apr'07 | 41876637 | 2871532 | 9641.00 | 77400 | 8969.658 |
| Total Steam Generation | 41876637 | | | Total Emissions | 8969.658 |
| | | Specific Emissions Factor | 0.00021419 | | |

**Baseline Emissions From Power Generation**

| Year | POWER GEN.(KWh) | FO CONS. (Kg) | NCV (Kcal/kg) | EF | Emissions (tCO2) |
|---|---|---|---|---|---|
| May 06- April 07 | 17779034 | 4166098 | 9641.00 | 77400.00 | 13013.42863 |
| HSD Consumption | Density | NCV (kcal/kg) | EF | Emissions (tCO2) | |
| 66145 | 0.827 | 9200 | 74100 | 156.1017564 | |
| Total Power Genration | 17779034 | | Total Emissions | | 13169.53 |
| | Specific Emission Factor | | 0.000740734 | | |

**Emission Reductions from Steam Generation**

| Year | Steam Generated (Kg) | Gas Consumtion (SCM) in WHRB | NCV (KCal/SCM) | Emission Factor (kgCO2/TJ) | Project Emissions for steam generation (tCO2) | Specific Emission Factor | Baseline Emissions for steam generation (tCO2) | Emission Reduction (tCO2) |
|---|---|---|---|---|---|---|---|---|
| 2008 | 84960000 | 1840800 | 8350 | 56100 | 3609.56749 | 0.00021419 | 18197.78773 | 14588.22024 |

**Emission Reductions from Electricity Generation**

| Year | Gas Consumption for electricity | NCV (KCal/SCM) | Emission Factor (kgCO2/TJ) | Emissions for electricity generation | Specific Emission Factor (Electricity) | Electricity Generated | Baseline Emissions for electricity | Emission Reduction |
|---|---|---|---|---|---|---|---|---|
| 2008 | 10620000 | 8350 | 56100 | 20824.43 | 0.000740734 | 28320000 | 20977.57958 | 153.1517571 |

## Annex 4
## MONITORING INFORMATION

Please Refer to Section B.7.2

\- - - - -