**CLEAN DEVELOPMENT MECHANISM**
**SIMPLIFIED PROJECT DESIGN DOCUMENT**
**FOR SMALL-SCALE PROJECT ACTIVITIES (SSC-CDM-PDD)**
**Version 02**

**CONTENTS**

**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>. |

## SECTION A. General description of the small-scale project activity

### A.1. Title of the small-scale project activity:

>> Waste heat recovery project based on technology up-gradation at Apollo Tyres, Vadodara, India.
Version 06
22/06/2006.

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

>> The project activity is the installation of energy efficient dual fuel fired turbine with waste heat recovery boiler in the Vadodara tyre manufacturing site of Apollo Tyres Limited (ATL). The project activity primarily aims at reducing green house gas (GHG) emissions through increase in efficiency and fuel switch in power and steam production. The gas turbine is using the natural gas for the power and steam generation; which is a cleaner fuel. The power and steam generation from the gas turbine has replaced the use of furnace oil (FO) in the boilers which were used for the steam generation. The project activity covers replacement of furnace oil with the natural gas in boilers.

The project activity is helping in sustainable development by GHG emission reduction. Project activity is using more efficient system and replacing the FO with the cleaner fuel and thus reducing the emissions in the atmosphere. The erection and commissioning of project has led to direct/ indirect employment to contactors/ sub-contactors and contract labours.

***View of project participants on the contribution of the project activity to sustainable development:***

Apollo Tyres Limited (ATL), which is the owner of the project activity, believes that the project activity has contributed and has further potential to shape the economic, environmental and social[1] life of the people in the region.

**Social well being:**

- Generated employment opportunities for the local people, both during construction and operation phases.

**Economical well being:**

- The project has created a business opportunity for local stakeholders such as suppliers, manufacturers, contractors etc.

**Environmental well being:**

- Since, the project uses clean fuel and efficient technology for power generation; it is leading to reduction in emissions in the environment.
- The project activity is a step towards environmental sustainability by saving exploitation and depletion of a natural, finite and non-renewable resource like coal/gas.

**Technological well being:**

[1] Ministry of Environment and Forest web site: http://envfor.nic.in/cdm/host_approval_criteria.htm

- The technology selected for the power project is the energy efficient low-NOx gas turbine technology; which is a well proven technology worldwide. In India the low NOx gas turbines are not common in practice. The Gas turbine supplied by the technology supplier (Solar turbines) is one of the first in manufacturing sector.

**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) | Apollo Tyres Limited (ATL) (Private entity) | No |

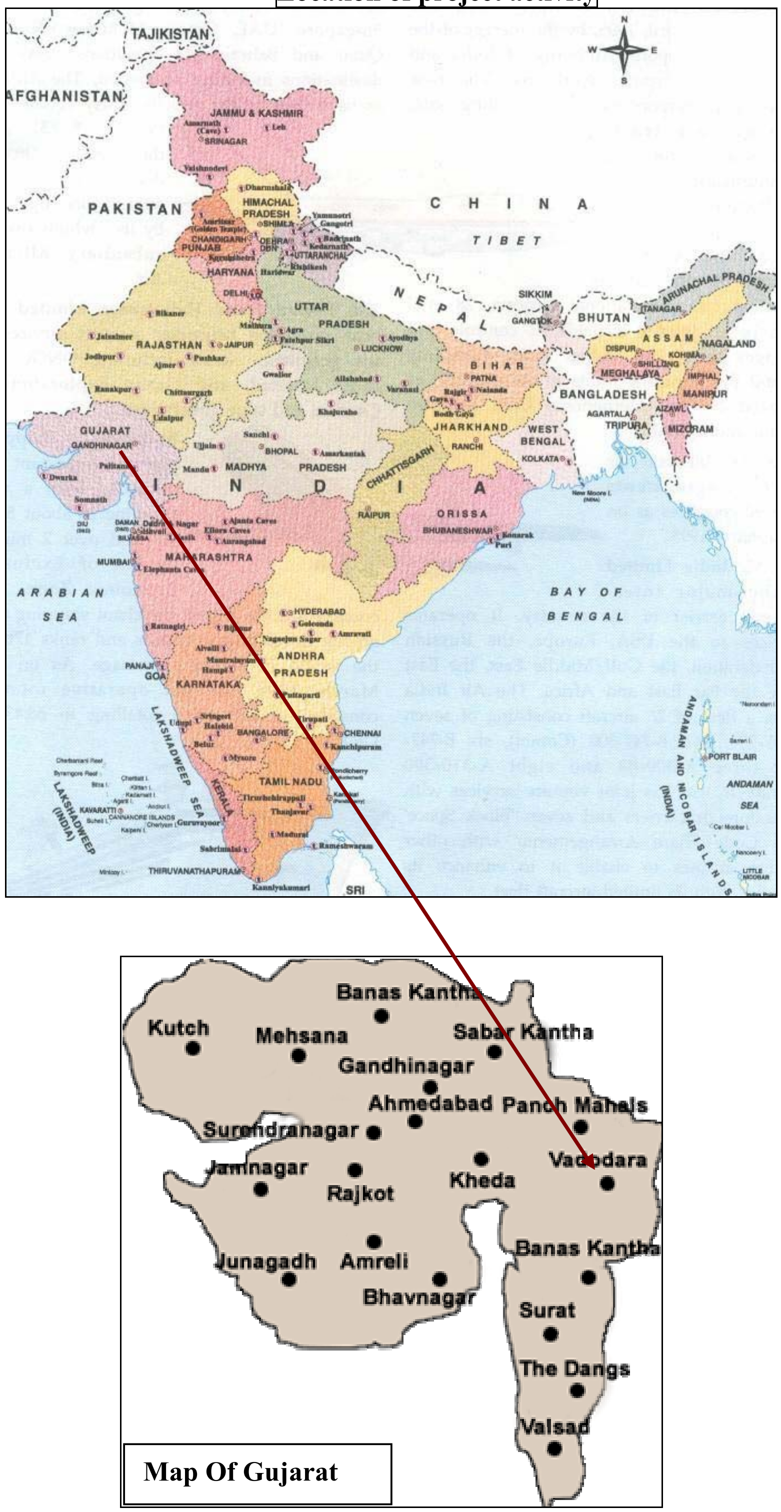
**A.4. Technical description of the small-scale project activity:**

>>

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

>> The map, showing the physical location, is given on next page.

**Location of project activity**




**Map Of Gujarat**

**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:**

>> Vadodara

**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 installed in the existing facility of ATL. The project activity is located at Limda, 25 km from the Vadodara city in Gujarat, India. Vadodara is located between latitude of 21°49' N to 22°49'N and longitude of 72°51' E to 74°17'E.

**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 scale 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 07), 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. 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 existing equipment or be installed in a new facility. The aggregate energy savings of a single project may not exceed the equivalent of 15 $GWh_e$ per year. A total saving of 15 $GWh_e$ per year is equivalent to a maximal saving of 45 $GWh_{th}$ per year in fuel input."

As per paragraph 1 of II. D. of appendix B of the UNFCCC defined simplified modalities and procedures for small-scale CDM project activities, 'The aggregate energy savings of a single project may not exceed the equivalent of 15 $GWh_e$ per year. A total saving of 15 $GWh_e$ per year is equivalent to a maximal saving of 45 $GWh_{th}$ per year in fuel input'. The project activity will reduce the input thermal energy to the tune of 22 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.

The baseline and emission reduction calculations from the project would be based on paragraphs 3 and 4 of appendix B (Version 07, dated 28th November 2005) and the monitoring methodology would be based on guidance provided in paragraph 6, 7 and 8 of II D of the same appendix B.

**Project Activity with technology details**

The ATL plant has substantial consumption of electrical energy and thermal energy in form of steam. The daily requirement of electricity is 0.22 million units and process steam requirement is 26 TPH.

Before the CDM project activity, the power requirement was partially fulfilled by the operation of two Diesel Generating (DG) Sets of 4200 kW capacity, fuelled by Furnace Oil (residual oil). The heat recovery boilers are installed on the exhaust gases of DG use to produce steam to the tune of about 1.75 Tones per Hour (TPH) each.

The CDM project activity was initiated with a view to upgrade the power generation technology with state-of-the-art energy efficiency and environment protection features. For this, one of the DG set was replaced with state-of-the-art low NOx Gas Turbine Generator (GTG) of 5500 kW ISO rating capacity. The GTG is equipped with a heat recovering unit on its exhaust gases, which produces 11.6 TPH steam. The Gas Turbine Generator is dual fuel fired and can be fired by fuels RLNG and High Speed Diesel (HSD). The gas turbine is operating with the RLNG since the commissioning of the project activity. The overall efficiency of this system is higher as compared to DG set based co-generation plant. The dual fuel fired Weishaupt burners have been installed in boilers for the use of RLNG.

**A.4.3. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small-scale project activity, taking into account national and/or sectoral policies and circumstances:**

>> The project activity is reducing GHG emissions by using the higher efficiency power generation system with the additional steam available for the process application. The project activity will reduce the emission from the power generation due to high efficiency and less GHG fuel usage. The additional steam from the gas turbine will reduce the fuel consumption in the boiler which would have been used for the same steam production.

Apart from the energy efficiency the project activity will save the emission from the fuel switch i.e. from FO to RLNG. The FO is highly carbon intensive fuel with respect to RLNG; Using RLNG as fuel will reduce the equivalent emissions from the process.

In the absence of project activity the project proponent have continued the baseline scenarion i.e. electricity generation by two DG sets & steam generation by FO fired boilers. Therefore, on account of power production with high energy efficiency and waste heat recovery to generate the steam and fuel switch in existing boilers, the reduction in GHG emissions occurs in ATL from December 2004..

Though the Ministry of Environment and Forest (MoEF), Ministry of Power (MoP) and Bureau of energy efficiency (BEE) in India encourage energy efficient operations, they do not require manufacturing industries to use specific technologies for power production or use of specific fuel. The project proponent has implemented the project activity over and above the national or sectoral requirements. The GHG reductions achieved by the project activity are additional to those directed by the governmental policies and regulations. The other "additionality" criteria of the project activity are dealt with in section B.

**A.4.3.1 Estimated amount of emission reductions over the chosen crediting period:**

>> The GHG emission reductions for a 10 year crediting period for ATL are provided in Tables 2.

**Table 2 Emission reductions at ATL**

| **Year** | **Annual estimation of emission reduction in tones of $CO_2$ e** |
|---|---|
| 2005 | 23429 |
| 2006 | 23429 |
| 2007 | 23429 |
| 2008 | 23429 |
| 2009 | 23429 |
| 2010 | 23429 |
| 2011 | 23429 |
| 2012 | 23429 |
| 2013 | 23429 |
| 2014 | 23429 |
| **Total estimated reductions** (tonnes of $CO_2$ e) | **234290** |
| **Total number of crediting years** | **10 years** |
| **Annual average over the crediting period of estimated reductions** (tonnes of $CO_2$ e) | **23,429** |

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

>> There is no public funding available in this project.

**A.4.5. Confirmation that the small-scale project activity is not a debundled component of a larger 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 C**[2]

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

According to above-mentioned points of de-bundling, ATL's project activity does not comply with above, therefore, considered as small scale CDM project activity.

[2] 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 methodology:

### B.1. Title and reference of the approved baseline 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 7 (28th November 2005)'.

### 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. For estimation of emissions from the electricity generated by the GTG and DG set the IPCC emission factors are used.

For estimating emissions from grid electricity use, 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 projects[3], as per which the emission coefficient (measured in kg$CO_2$/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 kg$CO_2$equ/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 kg$CO_2$equ/kWh) of recent capacity additions to the system, which capacity additions are defined as the greater (in MWh) of the most recent[4] 20% of existing plants or the 5 most recent plants;

***OR***

The weighted average emissions (in kg$CO_2$equ/kWh) of current generation mix.

---

[3] Refer AMS II.C (ver 07, 28th November 2005)
http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

[4] Generation data available for the most recent year

To assess the applicability of the relevant baseline methodology, a complete analysis of western regional electricity grid was carried out along with the study of various related issues like technology scenario, policy matters, which can further be used for preparation of baseline scenario and calculation of baseline emission factor of the grid. The information regarding baseline and project data is presented in the table below:

**Table 3: Baseline and project activity data requirement and data source**

| S. No. | Parameter | Data source |
|---|---|---|
| | **Baseline Scenario** | |
| 1 | Amount of Electricity imported from grid | Plant |
| 2 | Electricity emission factor | Published report for the quantity generated and IPCC emission factor |
| 3 | Amount of electricity generated from DG | Plant |
| 4 | Fuel consumption in DG | Plant |
| 5 | Calorific value of fuel | Plant /supplier |
| 6 | Emission factor of fuel used in DG | IPCC |
| 7 | Quantity of steam generated from boilers | Plant |
| 8 | Quantity of fuel used in boiler | Plant |
| 9 | Calorific value of fuel | Plant /supplier |
| 10 | Fuel emission factor | IPCC |
| 11 | Quantity of steam generated from DG waste heat recovery | Plant |
| | **Project Scenario** | |
| 12 | Amount of Electricity imported from grid | Plant |
| 13 | Electricity emission factor | Published report for the quantity generated and IPCC emission factor |
| 14 | Amount of electricity generated from DG | Plant |
| 15 | Fuel consumption in DG | Plant |
| 16 | Calorific value of the fuel used | Plant/supplier |
| 17 | Emission factor of fuel used in DG | IPCC |
| 18 | Quantity of steam generated from boilers | Plant |
| 19 | Quantity of fuel used in boiler | Plant |
| 20 | Calorific value of fuel used | Plant /supplier/National communication[5] |
| 21 | Fuel emission factor | IPCC |

[5] Initial National Communication to the United Nations Framework Convention on Climate Change submitted by India

| | | |
|---|---|---|
| 22 | Quantity of steam generated from DG waste heat recovery | Plant |
| 23 | Quantity of electricity generated in GTG | Plant |
| 24 | Quantity of fuel used | Plant |
| 25 | Calorific value of fuel used | Plant /supplier/National communication |
| 26 | Fuel emission factor | IPCC |
| 27 | Quantity of steam produced from GTG | Plant |

**B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered 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 realised 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 ATL were:

1. Electricity from State Electricity Grid and Steam generation from boiler running on NG.
2. Power & steam generation by diesel generating (DG) sets (Current practice)
3. Power and steam Generation with GT using Natural Gas as fuel (CDM Project Activity)
4. Power and steam Generation with boiler and steam turbine using Indian coal as fuel.

5. Power and steam Generation with boiler and steam turbine using Petcoke and imported coal as fuel

***Investment comparison analysis***

The four other options were available with the project proponent other than the baseline scenario. The tyre manufacturing is a continuous process and requires consistent quality uninterrupted electricity supply. The supply of electricity from electricity board is not under project proponent control; therefore this option is not opted in financial calculations. Internal Rate of Return (IRR) of the CDM project activity and its two alternatives is calculated and comparison is made.

***Calculation and comparison of financial indicators***

The result of IRR calculations are as following.

| *IRR* | *Power and steam Generation with GT using Natural Gas as fuel (CDM Project Activity)* | *Power and steam Generation with boiler and steam turbine using Indian coal as fuel.* | *Power and steam Generation with boiler and steam turbine using Petcoke and imported coal as fuel.* |
|---|---|---|---|
| IRR without CDM funds | 37.74% | 45.32% | 49.30% |
| IRR with CDM funds | 42.19% | | |

The detailed calculations can be referred from Excel Worksheet in Enclosure-1, Enclosure-2 and Enclosure-3. The assumptions taken for above CDM calculations are as follows.

1. The trend of fuel prices are assumed as follows.
   - Initial price of furnace oil Rs. 11144/MT with 6.4% escalation in Furnace oil (FO) price.
   - Initial price of NG Rs. 8.2/NM$^3$ with 10% Escalation in the price of NG for later five years of credit period.
   - Indian coal price Rs. 2700/MT, Petcoke price Rs. 3000/MT with 6.6% escalation in price of both fuels.
   - Initial price of grid power Rs. 5.3/kWh with price escalation 10.1% p.a.
2. Operation and Maintenance cost (3% of capital cost) is assumed to increase at 5% p.a..
3. Life of project is considered as 15 years.
4. CDM funds are available at the rate of 5.5 Euro/CER.

The IRR calculations are carried out for equivalent amount of electricity generation by all the power project alternatives. This means that a case for similar capacity Gas Turbines is considered for comparing with equivalent amount of electricity generation.

***Sensitivity analysis:***

| *Change in* | *IRR* | *Power and steam* | *Power and steam* | *Power and steam* |
|---|---|---|---|---|

| *Assumptions related to fuel price* | | *Generation with GT using Natural Gas as fuel (CDM Project Activity)* | *Generation with boiler and steam turbine using Indian coal as fuel.* | *Generation with boiler and steam turbine using Petcoke and imported coal as fuel.* |
|---|---|---|---|---|
| NG price rise in later 5 years: 12% p.a.<br>Grid power price rise: 8% p.a.<br>Indian coal /Petcoke price rise: 8% p.a.<br>Furnace Oil Price rise : 8% p.a. | IRR without CDM funds | 38.75% | 45.33% | 48.05% |
| | IRR with CDM funds | 43.24% | | |
| CER price of 6 Euro | IRR without CDM funds | 37.74% | 45.32% | 49.30% |
| | IRR with CDM funds | 42.60% | | |

Please refer Enclosure-4, Enclosure-5, Enclosure-6 and Enclosure-7 for sensitivity analysis.

The sensitivity analysis shows that in-spite of change in assumptions the CDM project remains a less attractive options. The results are interpreted as follows.

First Sensitivity Analysis shows that in spite of unfavorable deviation in fuel price trend, the CDM project remains less attractive as compared to coal based and petcoke based power generation projects. CDM funds help to improve the IRR of CDM project beyond petcoke based power generation project.

Second Sensitivity Analysis shows that the expected improvement in CER price will further improve the viability of CDM project over other alternatives.

Other than costlier option there was huge investment of more than 250 million in the project activity. The plant was running in the normal operations with the sufficiently available power and steam demand. The investment in the project activity is an additional investment on the plant.

**Technological barrier:** Although gas turbine electricity generation is a well proven technology for power generation but the project proponent has gone one step ahead in the technological advancement. The project proponent has installed low NOx turbine which is costlier and not common in power generation. The technology used by the project proponent is one of the first in the manufacturing industries in India[6].

**Other barriers:** Due to use of new technology the project proponent has faced operation problems. It was difficult to maintain flame temperature in low NOx mode. The project proponent has invested additional efforts for smooth operation of the GTG. The availability of specialist manpower was also a barrier to the project proponent.

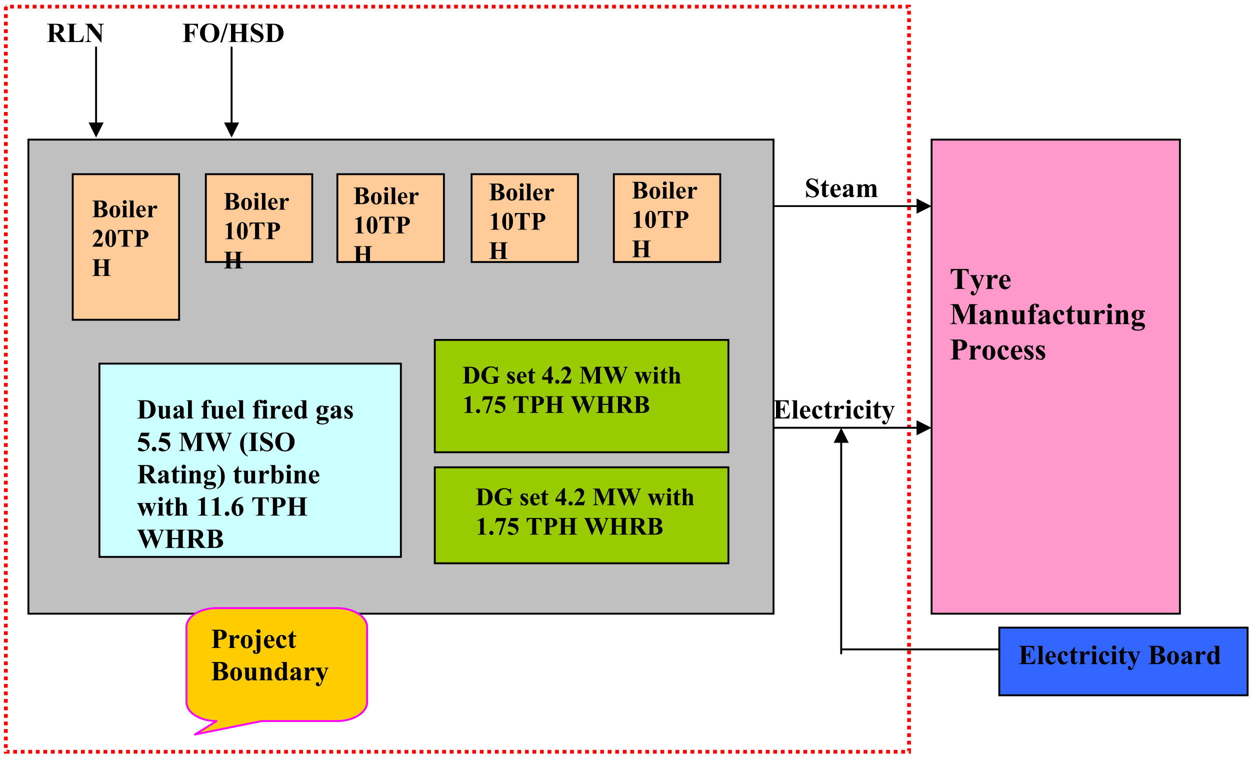
**B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the small-scale project activity:**

>> The project boundary is power generation house and boiler house located within the plant (ATL) premises at Limda village, Vadodara. Following are the components of project boundary.

1. Boilers and Fuels used for steam generation.
2. Diesel Generator with waste heat recovery boiler (WHRB) and fuel used for power generation
3. GTG with WHRB and fuel used for power generation.
4. Electricity purchased from State Electricity Board (Power Grid).

Pictorial representation of the project boundary is given below:

[6] The letter from technology supplier is available with the project proponent.




**B.5. Details of the baseline and its development:**

>> **Date of completing the baseline:** 24/12/2005

**Name of person/entity determining the baseline:** Apollo Tyres Ltd. And their consultants

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

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

>>

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

>> **04/02/2003**

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

>> 15 Years 0 month

### 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:

>> 01/01/2005

### C.2.2.2. Length:

>> 10 years 0 month

## SECTION D. Application of a monitoring methodology and plan:

>>

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

>> **Title:** Monitoring Methodology for the category II D – Energy efficiency and fuel switching measures for industrial facilities.

**Reference:** 'Paragraph 6 to 8' as provided in Type II.D. of Appendix B of the simplified modalities and procedures for small-scale CDM project activities - Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories.

### D.2. Justification of the choice of the methodology and why it is applicable to the small-scale project activity:

>> As established in Section A.4.2 the project activity falls under Category II.D. Energy efficient power and steam generation leads to mitigation of GHG emissions that would have been produced by the inefficient operation. In order to monitor the mitigation of GHG due to the project activity, the fuel used and electricity/steam generated quantities need to be measured. The project activity is the installation of new equipment and retrofit of existing equipment. The monitoring methodology covers both the aspects i.e. new equipment and retrofit.

In the monitoring plan mainly following data is monitored:

1. Energy use/Energy generated of all the equipments.
2. Fuel used for generation of electricity and steam.
3. Electricity imported from electricity board.

Based on the monitored data and the IPCC emission factors the baseline emissions and project activity emissions are calculated.

There is no technology transfer in the project activity therefore the project activity doesn't lead to any leakage emissions. The difference between the baseline and project emissions is reported as emission reduction from the project activity.

**D.3 Data to be monitored:**

>>

**Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:**

| ID number *(Please use numbers to ease cross-referencing to D.3)* | Data variable | Source of data | Data unit | Measured (m), calculated (c) or estimated (e) | Recording frequency | Proportion of data to be monitored | How will the data be archived? (electronic/ paper) | Comment |
|---|---|---|---|---|---|---|---|---|
| **Monitoring parameters in gas turbine** | | | | | | | | |
| *P.1* | *Quantity of fuel used* | *Plant* | *ScuM or ton* | *Measured* | *Monthly* | *100%* | *Paper & Electronic* | *Data archived: Crediting period + 2 yrs* |
| *P.2* | *Calorific value of fuel* | *Plant* | *GJ/ScuM or GJ/ton* | *Measured* | *Monthly* | *100%* | *Paper & Electronic* | *Data archived: Crediting period + 2 yrs* |
| *P.3* | *Quantity of electricity generated* | *Plant* | *KWh* | *Measured* | *Continuous recording & monthly reporting* | *100%* | *Paper & Electronic* | *Data archived: Crediting period + 2 yrs* |
| *P.4* | *Quantity of steam generated by waste heat boiler* | *Plant* | *Ton steam* | *Measured* | *Continuous recording & monthly reporting* | *100%* | *Paper & Electronic* | *Data archived: Crediting period + 2 yrs* |
| **Monitoring for electricity from electrical grid** | | | | | | | | |
| *P.5* | *Quantity of electricity purchased from electricity grid* | *Plant* | *KWh* | *Measured* | *Continuous recording & monthly reporting* | *100%* | *Paper & Electronic* | *Data archived: Crediting period + 2 yrs* |
| *P.6* | $CO_2$ *operating margin* | | *Kg* $CO_2$ */kWh* | *Calculated* | *Once* | *100%* | *Electronic* | *Small scale methodology I.D. For detailed calculations refer Enclosure-8.* |

| ID number *(Please use numbers to ease cross-referencing to D.3)* | Data variable | Source of data | Data unit | Measured (m), calculated (c) or estimated (e) | Recording frequency | Proportion of data to be monitored | How will the data be archived? (electronic/ paper) | Comment |
|---|---|---|---|---|---|---|---|---|
| | *emission factor for the grid* | | | | | | | |
| *P.7* | *$CO_2$ build margin emission factor for the grid* | | *Kg $CO_2$ /kWh* | *Calculated* | *Once* | *100%* | *Electronic* | *Small scale methodology I.D. For detailed calculations refer Enclosure-8.* |
| *P.8* | *$CO_2$ combined margin emission factor for the grid* | | *Kg $CO_2$ /kWh* | *Calculated* | *Once* | *100%* | *Electronic* | *Small scale methodology I.D. For detailed calculations refer Enclosure-8.* |
| **Monitoring of electricity generated from DG sets** | | | | | | | | |
| *P.9* | *Quantity of fuel used* | *Plant* | *Ton* | *Measured* | *Monthly* | *100%* | *Paper & Electronic* | *Data archived: Crediting period + 2 yrs* |
| *P.10* | *Calorific value of fuel* | *Plant* | *GJ/ton* | *Measured* | *Fixed* | *100%* | *Paper & Electronic* | *The value based on national communication will be considered for calculation.* |
| *P.11* | *Quantity of electricity generated* | *Plant* | *KWh* | *Measured* | *Continuous recording & monthly reporting* | *100%* | *Paper & Electronic* | *Data archived: Crediting period + 2 yrs* |
| *P.12* | *Quantity of steam generated by waste heat recovery* | *Plant* | *ton steam* | *Measured* | *Continuous recording & monthly reporting* | *100%* | *Paper & Electronic* | *Data archived: Crediting period + 2 yrs* |
| **Monitoring of steam generation from boiler** | | | | | | | | |
| *P.13* | *Quantity of* | *Plant* | *Ton* | *Measured* | *Monthly* | *100%* | *Paper &* | *Data archived: Crediting period + 2 yrs* |

| ID number *(Please use numbers to ease cross-referencing to D.3)* | Data variable | Source of data | Data unit | Measured (m), calculated (c) or estimated (e) | Recording frequency | Proportion of data to be monitored | How will the data be archived? (electronic/ paper) | Comment |
|---|---|---|---|---|---|---|---|---|
| | *fuel used* | | | | | | *Electronic* | |
| *P.14* | *Calorific value of fuel* | *Plant* | *GJ/ton* | *Measured* | *Each consignment* | *100%* | *Paper & Electronic* | *Calorific value of fuel to be taken from supplier (if reputed supplier such as Indian Oil, Gas Authority of India Limited (GAIL) etc.), or to be tested from some reputed laboratory on consignment to consignment basis. Monthly average to be calculated.* |
| *P.15* | *Quantity of steam generated by waste heat recovery* | *Plant* | *ton steam* | *Measured* | *Continuous recording & monthly reporting* | *100%* | *Paper & Electronic* | *Data archived: Crediting period + 2 yrs* |

**Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :**

| ID number *(Please use numbers to ease cross-referencing to table D.3)* | Data variable | Source of data | Data unit | Measured (m), calculated (c), estimated (e), | Recording frequency | Proportion of data to be monitored | How will the data be archived? (electronic/ paper) | Comment |
|---|---|---|---|---|---|---|---|---|
| **Monitoring for electricity from electrical grid** | | | | | | | | |

| ID number *(Please use numbers to ease cross-referencing to table D.3)* | Data variable | Source of data | Data unit | Measured (m), calculated (c), estimated (e), | Recording frequency | Proportion of data to be monitored | How will the data be archived? (electronic/ paper) | Comment |
|---|---|---|---|---|---|---|---|---|
| *B.1* | *Quantity of electricity purchased from electricity grid* | *Plant* | *KWh* | *Measured* | *Continuous recording & monthly reporting* | *100%* | *Paper & Electronic* | *Data archived: Crediting period + 2 yrs* |
| *B.2* | *$CO_2$ operating margin emission factor for the grid* | | *Kg $CO_2$ /kWh* | *Calculated* | *Once* | *100%* | *Electronic* | *Small scale methodology I.D. For detailed calculations refer Enclosure-8.* |
| *B.3* | *$CO_2$ build margin emission factor for the grid* | | *Kg $CO_2$ /kWh* | *Calculated* | *Once* | *100%* | *Electronic* | *Small scale methodology I.D. For detailed calculations refer Enclosure-8..* |
| *B.4* | *$CO_2$ combined margin emission factor for the grid* | | *Kg $CO_2$ /kWh* | *Calculated* | *Once* | *100%* | *Electronic* | *Small scale methodology I.D. For detailed calculations refer Enclosure-8.* |
| **Monitoring of electricity generated from DG sets** | | | | | | | | |
| *B.5* | *Quantity of fuel used* | *Plant* | *Ton* | *Measured* | *Monthly* | *100%* | *Paper & Electronic* | *Data archived: Crediting period + 2 yrs* |
| *B.6* | *Calorific value of fuel* | *Plant* | *GJ/ton* | *Measured* | *Fixed* | *100%* | *Paper & Electronic* | *The value based on national communication will be considered for calculation.* |

| ID number *(Please use numbers to ease cross-referencing to table D.3)* | Data variable | Source of data | Data unit | Measured (m), calculated (c), estimated (e), | Recording frequency | Proportion of data to be monitored | How will the data be archived? (electronic/ paper) | Comment |
|---|---|---|---|---|---|---|---|---|
| *B.7* | *Quantity of electricity generated* | *Plant* | *KWh* | *Measured* | *Continuous recording & monthly reporting* | *100%* | *Paper & Electronic* | *Data archived: Crediting period + 2 yrs* |
| *B.8* | *Quantity of steam generated by waste heat recovery* | *Plant* | *ton steam* | *Measured* | *Continuous recording & monthly reporting* | *100%* | *Paper & Electronic* | *Data archived: Crediting period + 2 yrs* |
| **Monitoring of steam generation from boiler** | | | | | | | | |
| *B.9* | *Quantity of fuel used* | *Plant* | *Ton* | *Measured* | *Monthly* | *100%* | *Paper & Electronic* | *Data archived: Crediting period + 2 yrs* |
| *B.10* | *Calorific value of fuel* | *Plant* | *GJ/ton* | *Measured* | *Monthly* | *100%* | *Paper & Electronic* | *Data archived: Crediting period + 2 yrs* |
| *B.11* | *Quantity of steam generated by waste heat recovery* | *Plant* | *ton steam* | *Measured* | *Continuous recording & monthly reporting* | *100%* | *Paper & Electronic* | *Data archived: Crediting period + 2 yrs* |

**D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:**

>>

**Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored**

| Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)* | Uncertainty level of data (High/Medium/Low) | Explain QA/QC procedures planned for these data, or why such procedures are not necessary. |
|---|---|---|
| *P.1* | *Low* | *ISO 9001 or similar type of quality system is required.* |
| *P.2* | *Low* | *ISO 9001 or similar type of quality system is required.* |
| *P.3* | *Low* | *ISO 9001 or similar type of quality system is required.* |
| *P.4* | *Low* | *ISO 9001 or similar type of quality system is required.* |
| *P.5* | *Low* | *ISO 9001 or similar type of quality system is required.* |
| *P.6* | *Low* | *Data received from government.* |
| *P.7* | *Low* | *Data received from government.* |
| *P.8* | *Low* | *Data received from government.* |
| *P.9* | *Low* | *ISO 9001 or similar type of quality system is required.* |
| *P.10* | *Low* | *ISO 9001 or similar type of quality system is required.* |
| *P.11* | *Low* | *ISO 9001 or similar type of quality system is required.* |
| *P.12* | *Low* | *ISO 9001 or similar type of quality system is required.* |
| *P.13* | *Low* | *ISO 9001 or similar type of quality system is required.* |
| *P.14* | *Low* | *ISO 9001 or similar type of quality system is required.* |
| *P.15* | *Low* | *ISO 9001 or similar type of quality system is required.* |
| *B.1* | *Low* | *ISO 9001 or similar type of quality system is required.* |
| *B.2* | *Low* | *Data received from government.* |
| *B.3* | *Low* | *Data received from government.* |
| *B.4* | *Low* | *Data received from government.* |
| *B.5* | *Low* | *ISO 9001 or similar type of quality system is required.* |
| *B.6* | *Low* | *ISO 9001 or similar type of quality system is required.* |
| *B.7* | *Low* | *ISO 9001 or similar type of quality system is required.* |
| *B.8* | *Low* | *ISO 9001 or similar type of quality system is required.* |
| *B.9* | *Low* | *ISO 9001 or similar type of quality system is required.* |
| *B.10* | *Low* | *ISO 9001 or similar type of quality system is required.* |
| *B.11* | *Low* | *ISO 9001 or similar type of quality system is required.* |

**D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:**

>> Emission monitoring and calculation procedure will follow the following organisational structure. All data and calculation formula required to proceed is given in the section D in PDD.

**Organisational structure for monitoring plan**

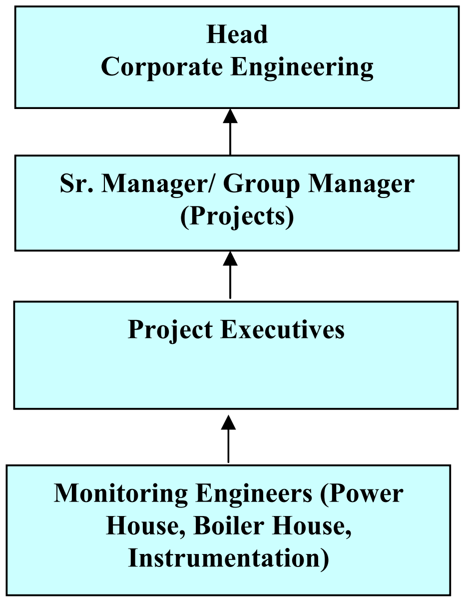



**Table --: Monitoring and calculation activities and responsibility**

| **Monitoring and calculation activities** | **Procedure and responsibility** |
|---|---|
| Data source and collection | Data is taken from the purchase, materials and accounting system. Most of the data is available in quality management system. |
| Frequency | Monitoring frequency should be as per section D of PDD. |
| Review | All received data is reviewed by the engineers in the CDM cell. |
| Data compilation | All the data is compiled and stored in CDM cell. |
| Emission calculation | Emission reduction calculations will be done annual based on the data collected. Engineers/Executives of CDM cell will do the calculations |
| Review | Sr. Manager/Manager, Corporate Engineering will review the calculation. |

| | |
|---|---|
| Emission data review | Final calculations is reviewed and approved by Head Corporate engineering. |
| Record keeping | All calculation and data record will be kept with the CDm cell. |

**D.6. Name of person/entity determining the monitoring methodology:**

>> Apollo Tyres Limited & their associated consultants

**SECTION E.: Estimation of GHG emissions by sources:**

**E.1. Formulae used:**

>>

**E.1.1 Selected formulae as provided in appendix B:**

>> No formulae for GHG emission reduction is specified for Category I.D of Appendix B of the Simplified Modalities and Procedures for Small-scale CDM Project Activities.

**E.1.2 Description of formulae when not provided in appendix B:**

>>

**E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:**

>> **Project emission calculation:**

**Step 1:** Specific Emission factor for each generation device

***1. For Turbine generator***

$$PSEF_{TG} = [(F_i \times CV_i \{EF_i + (MEF_i \times GWP(CH_4)) + (NEF_i \times GWP(N_2O))\}] / Elect_{Proj-TG}$$

Where

$PSEF_{TG}$ = Project specific emission factor for turbine generator (Equ. Kg $CO_2$/kWh)

Fi = Consumption of fuel *i* used in the project scenario (ton or SCuM)

CVi = Calorific value of fuel *i* used in the project scenario (GJ/Scum or GJ/ton)

EFi = Carbon dioxide emission factor per unit energy of fuel *i* (e.g. kg$CO_{2e}$/GJ) (combustion)

MEFi = Methane emission factor per unit energy of fuel *i* (e.g. t$CH_4$/GJ) (combustion)

GWP ($CH_4$) = Global warming potential (GWP) global warming potential of $CH_4$ set as 21 t$CO_{2e}$/t$CH_4$ for the 1st commitment period

NEF = Nitrous oxide emission factor per unit energy of fuel *i* (e.g. t$N_2O$/GJ) (combustion)

GWP ($N_2O$) = Global warming potential of $N_2O$ set as 310 t$CO_{2e}$/t$N_2O$ for the 1st commitment period

$Elect_{proj-TG}$ = Electricity generated by turbine generator in project scenario

***2. For diesel generator***

$$PSEF_{DG} = [(F_i \times CV_i \{EF_i + (MEF_i \times GWP(CH_4)) + (NEF_i \times GWP(N_2O))\}] / Elect_{Proj-DG}$$

Where

$PSEF_{DG}$ = Project specific emission factor for diesel generator (Equ. Kg $CO_2$/kWh)

Fi = Consumption of fuel *i* used in the project scenario (ton or SCuM)

CVi = Calorific value of fuel *i* used in the project scenario (GJ/Scum or GJ/ton)

EFi = Carbon dioxide emission factor per unit energy of fuel *i* (e.g. kg$CO_{2e}$/GJ) (combustion)

MEFi = Methane emission factor per unit energy of fuel *i* (e.g. t$CH_4$/GJ) (combustion)

GWP ($CH_4$) = Global warming potential (GWP) global warming potential of $CH_4$ set as 21 t$CO_{2e}$/t$CH_4$ for the 1st commitment period

NEF = Nitrous oxide emission factor per unit energy of fuel *i* (e.g. $tN_2O/GJ$) (combustion)
GWP ($N_2O$) = Global warming potential of $N_2O$ set as 310 $tCO_{2e}/tN_2O$ for the 1st commitment period
$Elect_{proj-DG}$ = Electricity generated by diesel generator in project scenario

***3. For Boiler***

$$PSEF_{Boiler} = [(F_i \times CV_i \{EF_i + (MEF_i \times GWP(CH_4)) + (NEF_i \times GWP(N_2O))\}] / Steam_{proj-Boiler}$$

Where
$PSEF_{Boiler}$ = Project specific emission factor for steam generating boiler (Equ. Kg $CO_2$/ton of steam)
Fi = Consumption of fuel *i* used in the project scenario (ton or SCuM)
CVi = Calorific value of fuel *i* used in the project scenario (GJ/Scum or GJ/ton)
EFi = Carbon dioxide emission factor per unit energy of fuel *i* (e.g. $kgCO_{2e}/GJ$) (combustion)
MEFi = Methane emission factor per unit energy of fuel *i* (e.g. $tCH_4/GJ$) (combustion)
GWP($CH_4$) = Global warming potential (GWP) global warming potential of CH4 set as 21 $tCO_{2e}/tCH_4$ for the 1st commitment period
NEF = Nitrous oxide emission factor per unit energy of fuel *i* (e.g. $tN_2O/GJ$) (combustion)
GWP ($N_2O$) = Global warming potential of $N_2O$ set as 310 $tCO_{2e}/tN_2O$ for the 1st commitment period
$Steam_{proj-Boiler}$ = Steam generated by boiler (tonnes) in project scenario

**Step 2:** Annual project emission

$$E_{Project} = [PSEF_{TG} \times Elect_{Proj-TG} + PSEF_{DG} \times Elect_{Proj-DG} + PSEF_{Boiler} \times Steam_{Proj-Boiler} + Elect_{proj-Grid} \times EF_{Grid}] / 1000$$

Where
$E_{project}$ = Emissions from the project activity (ton $CO_2$)
$Elec_{proj-Grid}$ = Electricity purchased from grid (kWh)
$EF_{Grid}$ = Grid Emission factor (kg $CO_2$/kWh)

**E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities**

>> There is no technology transfer in project activity. No leakage is envisaged in project activity.

**E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the small-scale project activity emissions:**

>> It will remain same as project emissions.

**E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities:**

>> **Baseline emission calculation:**

**Step 1:** Specific Emission factor for each generation device

***1. For diesel generator***

$$BSEF_{DG} = [(F_i \times CV_i \{EF_i + (MEF_i \times GWP(CH_4)) + (NEF_i \times GWP(N_2O))\}] / Elect_{Base-DG}$$

Where

$BSEF_{DG}$ = Baseline specific emission factor for diesel generator (Equ. Kg $CO_2$/kWh)

Fi = Consumption of fuel *i* used in the project scenario (ton or SCuM)

CVi = Calorific value of fuel *i* used in the project scenario (GJ/Scum or GJ/ton)

EFi = Carbon dioxide emission factor per unit energy of fuel *i* (e.g. $kgCO_{2e}$/GJ) (combustion)

MEFi = Methane emission factor per unit energy of fuel *i* (e.g. $tCH_4$/GJ) (combustion)

GWP($CH_4$) = Global warming potential (GWP) global warming potential of $CH_4$ set as 21 $tCO_{2e}/tCH_4$ for the 1st commitment period

NEF = Nitrous oxide emission factor per unit energy of fuel *i* (e.g. $tN_2O$/GJ) (combustion)

GWP ($N_2O$) = Global warming potential of $N_2O$ set as 310 $tCO_{2e}/tN_2O$ for the 1st commitment period

$Elect_{Base-DG}$ = Electricity generated by diesel generator in baseline scenario

***2. For Boiler***

$$BSEF_{Boiler} = [(F_i \times CV_i \{EF_i + (MEF_i \times GWP(CH_4)) + (NEF_i \times GWP(N_2O))\}] / Steam_{Base-Boiler}$$

Where

$BSEF_{Boiler}$ = Baseline specific emission factor for steam generating boiler (Equ. Kg $CO_2$/ton of steam)

Fi = Consumption of fuel *i* used in the project scenario (ton or SCuM)

CVi = Calorific value of fuel *i* used in the project scenario (GJ/Scum or GJ/ton)

EFi = Carbon dioxide emission factor per unit energy of fuel *i* (e.g. kgCO2e/GJ) (combustion)

MEFi = Methane emission factor per unit energy of fuel *i* (e.g. $tCH_4$/GJ) (combustion)

GWP($CH_4$) = Global warming potential (GWP) global warming potential of $CH_4$ set as 21 $tCO_{2e}/tCH_4$ for the 1st commitment period

NEF = Nitrous oxide emission factor per unit energy of fuel *i* (e.g. $tN_2O$/GJ) (combustion)

GWP ($N_2O$) = Global warming potential of $N_2O$ set as 310 $tCO_{2e}/tN_2O$ for the 1st commitment period

$Steam_{Base-Boiler}$ = Steam generated by boiler (tonnes) in baseline scenario

**Step 2:** Annual baseline emission

$$E_{Baseline} = [BSEF_{DG} \times (Elect_{\Pr oj-DG} + Elect_{\Pr oj-TG}) + BSEF_{Boiler} \times Steam_{\Pr oj-Boiler} + Elect_{proj-Grid} \times EF_{Grid} + (Steam_{\Pr oj-TG} + Steam_{\Pr oj-DG} - Steam_{Base-DG}) \times BSEF_{Boiler}] / 1000$$

Where

$E_{project}$ = Emissions from the project activity (ton $CO_2$)

$Elec_{proj-Grid}$ = Electricity purchased from grid in project scenario (kWh)

$EF_{Grid}$ = Grid Emission factor (kg $CO_2$/kWh)
$Steam_{Proj-TG}$ = Steam generated by the turbine generator waste heat in project scenario (tonnes)
$Steam_{Proj-DG}$ = Steam generated by the diesel generator waste heat in project scenario (tonnes)
$Steam_{Base-DG}$ = Steam generated by the diesel generator waste heat in baseline scenario (tonnes)

**E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:**

>>

**$CO_2$ emission reduction due to project activity** = (Baseline emission) **-** (Project emissions )

**E.2 Table providing values obtained when applying formulae above:**

>>

| **Year** | **Estimation of baseline emission reductions (tonnes of $CO_2$ e)** | **Estimation of project activity emission reductions (tonnes of $CO_2$ e)** | **Estimation of emission reductions (tonnes of $CO_2$ e)** |
|---|---|---|---|
| 2005 | 101624 | 78195 | 23429 |
| 2006 | 101624 | 78195 | 23429 |
| 2007 | 101624 | 78195 | 23429 |
| 2008 | 101624 | 78195 | 23429 |
| 2009 | 101624 | 78195 | 23429 |
| 2010 | 101624 | 78195 | 23429 |
| 2011 | 101624 | 78195 | 23429 |
| 2012 | 101624 | 78195 | 23429 |
| 2013 | 101624 | 78195 | 23429 |
| 2014 | 101624 | 78195 | 23429 |
| **Total estimated reductions (tonnes $CO_2$ equ.)** | **1016240** | **781950** | **234290** |
| **Total no of Crediting Years** | 10 years | 10 years | 10 years |
| **Annual average over the crediting period of estimated reductions (tonnes of $CO_2$ e)** | **101624** | **78195** | **23429** |

## 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 I[7] 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.

ATL'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 emission in tyre manufacturing process. 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.

***Environmental 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 DG set 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 activity does not contribute to noise pollution. | - |

## SECTION G. Stakeholders' comments:

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

>> ATL had organised 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. GAIL
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 does not require displacement of any local population. The distance between the electrical substation for power evacuation and the plant is very less, hence installation of transmission lines would not create any inconvenience to the local population.

Thus, the project will not cause any adverse social impacts on local population. ATL has already completed the necessary consultation and documented the approval by local population for the project and received positive comments. The village surpanch has appreciated the project proponent about the project activity.

GSPCB has prescribed standards of environmental compliance and monitors the adherence to the standards. GSPCB have issued Consent to Establish (CTE) and consent to operate (CTO).
Projects consultants were involved in the project activity to take care of the various pre contract and post contract issues / activities like preparation of basic and detailed engineering documents, preparation of tender documents, and selection of vendors / suppliers. They would be further involved in supervision of project operation, implementation, successful commissioning and trial run.

[7] http://www.envfor.nic.in/legis/eia

**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: | Apollo Tyres Limited |
| Street/P.O.Box: | Limda |
| Building: | |
| City: | Vadodara |
| State/Region: | Gujarat |
| Postfix/ZIP: | |
| Country: | India |
| Telephone: | 91-2668-262580 |
| FAX: | 91-2668-262588 |
| E-Mail: | krpillai@apollotyres.com |
| URL: | |
| Represented by: | |
| Title: | Head - Corporate Engineering |
| Salutation: | Mr. |
| Last Name: | Pillai |
| Middle Name: | Radhakrishna |
| First Name: | K |
| Department: | |
| Mobile: | |
| Direct FAX: | |
| Direct tel: | |
| Personal E-Mail: | |

## Annex 2

### INFORMATION REGARDING PUBLIC FUNDING

No public funding received for the project.

## Annex 3

## Baseline Information

**Baseline data of August 2004**

| POWER, STEAM AND FUEL RECORD FOR THE MONTH OF AUG-04 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| DATE | TOTAL DG POWER (kWh) | TOTAL DG FUEL (Lts) | GEB (kWh | TOTAL POWER (kWh) | Steam from Boiler MT | Steam from WHRB 1 (MT) | Steam from WHRB 2 (MT) | Total Steam generation (MT) | Total fuel consumption for steam |
| 1-Aug-2004 | 152300 | 38310 | 56700 | 209000 | 641.33 | 33.254 | 33.254 | 707.8382 | 44.692 |
| 2-Aug-2004 | 153310 | 38690 | 55950 | 209260 | 660.66 | 31.28 | 31.28 | 723.2197 | 46.039 |
| 3-Aug-2004 | 153535 | 38800 | 63480 | 217015 | 640.283 | 34.659 | 34.659 | 709.6007 | 44.619 |
| 4-Aug-2004 | 150215 | 38000 | 61470 | 211685 | 646.997 | 31.412 | 31.412 | 709.821 | 45.0869 |
| 5-Aug-2004 | 156250 | 39520 | 53400 | 209650 | 593.487 | 31.23 | 31.23 | 655.9473 | 41.358 |
| 6-Aug-2004 | 156175 | 39280 | 57510 | 213685 | 644.961 | 32.127 | 32.127 | 709.2148 | 44.945 |
| 7-Aug-2004 | 93900 | 24080 | 125910 | 219810 | 662.898 | 15.3425 | 15.3425 | 693.5833 | 46.195 |
| 8-Aug-2004 | 154400 | 38790 | 61140 | 215540 | 658.837 | 27.689 | 27.689 | 714.2152 | 45.912 |
| 9-Aug-2004 | 108818 | 27970 | 101790 | 210608 | 656.685 | 19.002 | 19.002 | 694.6887 | 45.762 |
| 10-Aug-2004 | 156968 | 39570 | 62970 | 219938 | 656.756 | 29.002 | 29.002 | 714.7605 | 45.767 |
| 11-Aug-2004 | 151504 | 38170 | 59610 | 211114 | 651.892 | 33.092 | 33.092 | 718.0758 | 45.428 |
| 12-Aug-2004 | 157353 | 39680 | 60330 | 217683 | 664.405 | 23.271 | 23.271 | 710.947 | 46.3 |
| 13-Aug-2004 | 157010 | 39480 | 60300 | 217310 | 664.606 | 27.73 | 27.73 | 720.0659 | 46.314 |
| 14-Aug-2004 | 155101 | 39090 | 56040 | 211141 | 662.496 | 27.203 | 27.203 | 716.9025 | 46.167 |
| 15-Aug-2004 | 23840 | 6910 | 32070 | 55910 | 267.929 | 4.6785 | 4.6785 | 277.2859 | 18.671 |
| 16-Aug-2004 | 151906 | 38360 | 59160 | 211066 | 620.236 | 26.601 | 26.601 | 673.4377 | 43.222 |
| 17-Aug-2004 | 155421 | 39120 | 60240 | 215661 | 639.407 | 29.225 | 29.225 | 697.8573 | 44.558 |
| 18-Aug-2004 | 152787 | 38570 | 63360 | 216147 | 599.73 | 28.479 | 28.479 | 656.6876 | 41.793 |
| 19-Aug-2004 | 149720 | 37810 | 59070 | 208790 | 682.314 | 27.802 | 27.802 | 737.9178 | 47.548 |
| 20-Aug-2004 | 153455 | 38720 | 63090 | 216545 | 630.166 | 28.16 | 28.16 | 686.4859 | 43.914 |
| 21-Aug-2004 | 152850 | 38490 | 62220 | 215070 | 639.077 | 27.495 | 27.495 | 694.0673 | 44.535 |
| 22-Aug-2004 | 146970 | 37220 | 63210 | 210180 | 624.11 | 27.116 | 27.116 | 678.3422 | 43.492 |
| 23-Aug-2004 | 154330 | 38970 | 59940 | 214270 | 640.455 | 29.509 | 29.509 | 699.4729 | 44.631 |
| 24-Aug-2004 | 152860 | 38450 | 65880 | 218740 | 745.181 | 31.852 | 31.852 | 808.8852 | 51.929 |
| 25-Aug-2004 | 153525 | 38750 | 69420 | 222945 | 511.836 | 31.108 | 31.108 | 574.0518 | 35.668 |
| 26-Aug-2004 | 151150 | 38190 | 66360 | 217510 | 664.764 | 29.286 | 29.286 | 723.3358 | 46.325 |
| 27-Aug-2004 | 154425 | 38790 | 66570 | 220995 | 611.798 | 29.267 | 29.267 | 670.3319 | 42.634 |
| 28-Aug-2004 | 11571 | 3250 | 23550 | 35121 | 0 | 0 | 0 | 0 | 0 |
| 29-Aug-2004 | 0 | 0 | 12390 | 12390 | 0 | 0 | 0 | 0 | 0 |
| 30-Aug-2004 | 16515 | 4330 | 39960 | 56475 | 0 | 0 | 0 | 0 | 0 |
| 31-Aug-2004 | 102484 | 25710 | 93420 | 195904 | 561.51 | 27.732 | 27.732 | 616.974 | 44.051 |
| **Average** | 147730 | 37281 | 66242.2 | 213973 | 639.884 | 28.5158 | 28.51576 | 696.9158 | 44.773515 |

## Baseline data of September 2004

| POWER, STEAM AND FUEL RECORD FOR THE MONTH OF Sep-04 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| DATE | TOTAL DG POWER (kWh) | TOTAL DG FUEL (Lts) | GEB (kWh) | TOTAL POWER (kWh) | Steam from Boiler MT | Steam from WHRB 1 (MT) | Steam from WHRB 2 (MT) | Total Steam generation (MT) | Total fuel consumption for steam |
| 1-Sep-2004 | 150897 | 37880 | 63300 | 214197 | 556.245 | 27.26 | 27.26 | 610.763 | 42.168 |
| 2-Sep-2004 | 138152 | 34950 | 79770 | 217922 | 573.446 | 28.83 | 28.83 | 631.11 | 44.343 |
| 3-Sep-2004 | 152629 | 38380 | 68340 | 220969 | 549.491 | 28.13 | 28.13 | 605.757 | 40.875 |
| 4-Sep-2004 | 154485 | 38400 | 68040 | 222525 | 561.917 | 29.04 | 29.04 | 619.988 | 43.4525 |
| 5-Sep-2004 | 153301 | 38960 | 68340 | 221641 | 586.688 | 28.15 | 28.15 | 642.984 | 43.4525 |
| 6-Sep-2004 | 154540 | 38970 | 69750 | 224290 | 568.045 | 29.05 | 29.05 | 626.153 | 44.262 |
| 7-Sep-2004 | 146639 | 37150 | 65190 | 211829 | 713.8 | 28.03 | 28.03 | 769.866 | 43.398 |
| 9-Sep-2004 | 147212 | 37120 | 61260 | 208472 | 648 | 25.52 | 25.52 | 699.03 | 42.911 |
| 9-Sep-2004 | 150500 | 38010 | 66600 | 217100 | 704.7 | 24.75 | 24.75 | 754.206 | 43.986 |
| 10-Sep-2004 | 154585 | 38940 | 70050 | 224635 | 706 | 28.84 | 28.84 | 763.686 | 45.917 |
| 11-Sep-2004 | 133480 | 33910 | 89610 | 223090 | 659 | 23.56 | 23.56 | 706.12 | 43.405 |
| 12-Sep-2004 | 154325 | 38740 | 69060 | 223385 | 648 | 27.14 | 27.14 | 702.274 | 43.405 |
| 13-Sep-2004 | 153225 | 38720 | 70680 | 223905 | 662 | 28.03 | 28.03 | 718.054 | 46.034 |
| 14-Sep-2004 | 152110 | 38360 | 70230 | 222340 | 667.5 | 26.50 | 26.50 | 720.494 | 46.04 |
| 15-Sep-2004 | 148050 | 37270 | 68130 | 216180 | 680.4 | 24.42 | 24.42 | 729.248 | 46.847 |
| 16-Sep-2004 | 151750 | 38610 | 70080 | 221830 | 620 | 26.81 | 26.81 | 673.62 | 46.325 |
| 17-Sep-2004 | 154325 | 38450 | 72330 | 226655 | 585 | 35.33 | 35.33 | 655.656 | 44.454 |
| 19-Sep-2004 | 155725 | 39170 | 70230 | 225955 | 785 | 34.10 | 34.10 | 853.2 | 45.411 |
| 19-Sep-2004 | 156275 | 39330 | 65910 | 222185 | 759 | 31.68 | 31.68 | 822.356 | 45.411 |
| 20-Sep-2004 | 157822 | 39930 | 66000 | 223822 | 707 | 30.35 | 30.35 | 767.7 | 54.208 |
| 21-Sep-2004 | 154913 | 39100 | 68730 | 223643 | 668 | 30.02 | 30.02 | 728.044 | 35.695 |
| 22-Sep-2004 | 159962 | 40160 | 65700 | 225662 | 671 | 29.63 | 29.63 | 730.266 | 45.571 |
| 23-Sep-2004 | 157773 | 39800 | 63150 | 220923 | 679 | 29.30 | 29.30 | 737.594 | 44.526 |
| 24-Sep-2004 | 160385 | 40390 | 68280 | 228665 | 702 | 29.66 | 29.66 | 761.318 | 44.708 |
| 25-Sep-2004 | 161283 | 40540 | 69240 | 230523 | 709 | 29.80 | 29.80 | 768.603 | 53.377 |
| 26-Sep-2004 | 161751 | 40660 | 69660 | 231411 | 711 | 27.21 | 27.21 | 765.422 | 38.205 |
| 27-Sep-2004 | 155885 | 39380 | 66720 | 222605 | 701 | 33.21 | 33.21 | 767.424 | 43.699 |
| 29-Sep-2004 | 160031 | 40340 | 71340 | 231371 | 713 | 33.61 | 33.61 | 780.222 | 46.423 |
| 29-Sep-2004 | 156555 | 39420 | 72420 | 228975 | 687 | 32.82 | 32.82 | 752.646 | 44.333 |
| 30-Sep-2004 | 158985 | 40020 | 72930 | 231915 | 661 | 31.83 | 31.83 | 724.666 | 45.281 |
| Average | 153585 | 38702 | 69369 | 222954 | 661.4411 | 29.0873 | 29.0873 | 719.6157 | 44.6041 |

# Baseline data of October 2004

| POWER, STEAM AND FUEL RECORD FOR THE MONTH OF OCT-04 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| DATE | TOTAL DG POWER (kWh) | TOTAL DG FUEL (Lts) | EB (kWh | TOTAL POWER (kWh) | Steam from Boiler MT | Steam from WHRB 1 (MT) | Steam from WHRB 2 (MT) | Total Steam generation (MT) | Total fuel consumption for steam (KL) |
| 1-Oct-2004 | 160515 | 40250 | 69960 | 230475 | 631 | 31.41 | 31.41 | 693.82 | 46.616 |
| 2-Oct-2004 | 160000 | 40150 | 70050 | 230050 | 646 | 31.24 | 31.24 | 708.48 | 46.889 |
| 3-Oct-2004 | 161845 | 40580 | 67560 | 229405 | 642 | 31.42 | 31.42 | 704.83 | 46.889 |
| 4-Oct-2004 | 161375 | 40460 | 70200 | 231575 | 629 | 30.11 | 30.11 | 689.23 | 46.865 |
| 5-Oct-2004 | 125595 | 31940 | 106260 | 231855 | 647 | 21.53 | 21.53 | 690.06 | 47.778 |
| 6-Oct-2004 | 159025 | 39680 | 66750 | 225775 | 651 | 33.78 | 33.78 | 718.57 | 47.931 |
| 7-Oct-2004 | 162725 | 40560 | 69090 | 231815 | 632 | 33.64 | 33.64 | 699.27 | 47.277 |
| 10-Oct-2004 | 160875 | 40210 | 70140 | 231015 | 639 | 30.49 | 30.49 | 699.98 | 45.757 |
| 10-Oct-2004 | 162125 | 40520 | 72120 | 234245 | 675 | 33.26 | 33.26 | 741.51 | 48.314 |
| 10-Oct-2004 | 163840 | 40760 | 68760 | 232600 | 660.2 | 31.82 | 31.82 | 723.84 | 47.752 |
| 11-Oct-2004 | 166129 | 41370 | 69630 | 235759 | 643.4 | 29.33 | 29.33 | 702.05 | 46.129 |
| 12-Oct-2004 | 165964 | 41120 | 71550 | 237514 | 631 | 31.48 | 31.48 | 693.97 | 48.296 |
| 13-Oct-2004 | 160357 | 39940 | 69480 | 229837 | 648.3 | 29.57 | 29.57 | 707.43 | 49.254 |
| 14-Oct-2004 | 165296 | 41190 | 69090 | 234386 | 621.5 | 30.54 | 30.54 | 682.57 | 46.482 |
| 15-Oct-2004 | 160600 | 40050 | 73650 | 234250 | 628.6 | 30.59 | 30.59 | 689.78 | 47.204 |
| 16-Oct-2004 | 159752 | 39750 | 64950 | 224702 | 626.1 | 28.03 | 28.03 | 682.16 | 47.355 |
| 17-Oct-2004 | 157228 | 39150 | 64590 | 221818 | 642 | 30.81 | 30.81 | 703.62 | 45.996 |
| 18-Oct-2004 | 152427 | 38060 | 73680 | 226107 | 635.6 | 29.28 | 29.28 | 694.16 | 48.914 |
| 19-Oct-2004 | 149372 | 36820 | 65340 | 214712 | 607 | 27.74 | 27.74 | 662.49 | 43.914 |
| 20-Oct-2004 | 150670 | 37680 | 77910 | 228580 | 585 | 28.60 | 28.60 | 642.2 | 45.3 |
| 21-Oct-2004 | 140660 | 35400 | 64260 | 204920 | 584 | 34.18 | 34.18 | 652.35 | 42 |
| 22-Oct-2004 | 140965 | 35480 | 68010 | 208975 | 534.3 | 33.13 | 33.13 | 600.56 | 38.936 |
| 23-Oct-2004 | 149220 | 37480 | 65070 | 214290 | 549.6 | 31.78 | 31.78 | 613.16 | 42.077 |
| 24-Oct-2004 | 149845 | 37670 | 66390 | 216235 | 551.5 | 30.95 | 30.95 | 613.39 | 42.555 |
| 25-Oct-2004 | 150745 | 37840 | 73080 | 223825 | 568 | 29.09 | 29.09 | 626.19 | 43.2 |
| 26-Oct-2004 | 148925 | 37430 | 83310 | 232235 | 580 | 27.80 | 27.80 | 635.6 | 42.6 |
| 27-Oct-2004 | 148275 | 37260 | 84300 | 232575 | 585.1 | 29.63 | 29.63 | 644.36 | 42.406 |
| 28-Oct-2004 | 149175 | 37450 | 89160 | 238335 | 602.8 | 29.33 | 29.33 | 661.45 | 43.223 |
| 29-Oct-2004 | 148350 | 37260 | 83070 | 231420 | 601.9 | 30.77 | 30.77 | 663.43 | 42.5 |
| 30-Oct-2004 | 105600 | 26650 | 127380 | 232980 | 593.8 | 28.40 | 28.40 | 650.6 | 44.331 |
| 31-Oct-2004 | 152850 | 38270 | 78840 | 231690 | 597.5 | 28.2 | 28.2 | 653.9 | 42.5 |
| Avergae | 153236.3 | 38336 | 74633.2 | 227869.5 | 615.14 | 30.25469 | 30.255 | 675.64 | 45.395 |

# Annex 4
## Calculations

| Certified Emission Reduction from waste heat recovery project at Apollo Tyres, Vadodara, Gujarat, India | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Electricity & steam Generation scenario** | **Units** | **Baseline** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** |
| **Gas turbine** | | | | | | | | | | | | |
| Calorific value (LCV) of fuel used | GJ/SCuM | | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 |
| Electricity generated by the fuel used | kWh | | 29304185 | 29304185 | 29304185 | 29304185 | 29304185 | 29304185 | 29304185 | 29304185 | 29304185 | 29304185 |
| Fuel consumption in Gas turbine | SCuM | | 10557700 | 10557700 | 10557700 | 10557700 | 10557700 | 10557700 | 10557700 | 10557700 | 10557700 | 10557700 |
| Quantity of steam generated from the waste heat | Tons | | 71000 | 71000 | 71000 | 71000 | 71000 | 71000 | 71000 | 71000 | 71000 | 71000 |
| Net emission factor | Equ kg $CO_2$/GJ | | 56.1 | 56.1 | 56.1 | 56.1 | 56.1 | 56.1 | 56.1 | 56.1 | 56.1 | 56.1 |
| Specific emissions | kg $CO_2$/kWh | | 0.715 | 0.715 | 0.715 | 0.715 | 0.715 | 0.715 | 0.715 | 0.715 | 0.715 | 0.715 |
| **Power from GEB** | | | | | | | | | | | | |
| Total power imported from GEB | kWh | 24878755 | 25075425 | 25075425 | 25075425 | 25075425 | 25075425 | 25075425 | 25075425 | 25075425 | 25075425 | 25075425 |
| Emission factor | kg $CO_2$/kWh | 0.760 | 0.760 | 0.760 | 0.760 | 0.760 | 0.760 | 0.760 | 0.760 | 0.760 | 0.760 | 0.760 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Power generation from DG** | | | | | | | | | | | | |
| Total power generated | kwh | 51730955 | 25902220 | 25902220 | 25902220 | 25902220 | 25902220 | 25902220 | 25902220 | 25902220 | 25902220 | 25902220 |
| Quantity of steam generated from the waste heat | tons | 19880 | 9230 | 9230 | 9230 | 9230 | 9230 | 9230 | 9230 | 9230 | 9230 | 9230 |
| Total fuel consumption | ton | 12363.2 | 6212.8 | 6212.8 | 6212.8 | 6212.8 | 6212.8 | 6212.8 | 6212.8 | 6212.8 | 6212.8 | 6212.8 |
| Calorific value (LCV) of fuel used | GJ/ton | 40.19 | 40.19 | 40.19 | 40.19 | 40.19 | 40.19 | 40.19 | 40.19 | 40.19 | 40.19 | 40.19 |
| Net emission factor | Equ kg $CO_2$/GJ | 77.6 | 77.6 | 77.6 | 77.6 | 77.6 | 77.6 | 77.6 | 77.6 | 77.6 | 77.6 | 77.6 |
| Specific emissions | kg $CO_2$/kWh | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 |
| **Steam generation from boiler** | | | | | | | | | | | | |
| Total steam generation required (Based on the Baseline) | Tons | 217970 | 137740 | 137740 | 137740 | 137740 | 137740 | 137740 | 137740 | 137740 | 137740 | 137740 |
| Quantity of FO required | tonnes | 14614.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Calorific value of FO | GJ/ton | 40.19 | 40.19 | 40.19 | 40.19 | 40.19 | 40.19 | 40.19 | 40.19 | 40.19 | 40.19 | 40.19 |
| Emission factor | equ kg$CO_2$/GJ | 77.60 | 77.60 | 77.60 | 77.60 | 77.60 | 77.60 | 77.60 | 77.60 | 77.60 | 77.60 | 77.60 |
| Quantity of steam generated | tonnes | | 149455 | 149455 | 149455 | 149455 | 149455 | 149455 | 149455 | 149455 | 149455 | 149455 |
| Quantity of RLNG | SCuM | | 10291805 | 10291805 | 10291805 | 10291805 | 10291805 | 10291805 | 10291805 | 10291805 | 10291805 | 10291805 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| required | | | | | | | | | | | | |
| Calorific value of RLNG | GJ/SCuM | | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 |
| Emission factor | equ kg$CO_2$/GJ | | 56.1 | 56.1 | 56.1 | 56.1 | 56.1 | 56.1 | 56.1 | 56.1 | 56.1 | 56.1 |
| Specific emissions | kg $CO_2$/ton of steam | 209.09 | 136.61 | 136.61 | 136.61 | 136.61 | 136.61 | 136.61 | 136.61 | 136.61 | 136.61 | 136.61 |
| Baseline emissions | ton $CO_2$/annum | | 101624 | 101624 | 101624 | 101624 | 101624 | 101624 | 101624 | 101624 | 101624 | 101624 |
| Project activity emissions | ton $CO_2$/annum | | 78195 | 78195 | 78195 | 78195 | 78195 | 78195 | 78195 | 78195 | 78195 | 78195 |
| **Annual Emission reduction** | ton $CO_2$/annum | | **23429** | **23429** | **23429** | **23429** | **23429** | **23429** | **23429** | **23429** | **23429** | **23429** |

## Appendix A: Abbreviations

| | |
|---|---|
| **ATL** | Apollo Tyres Limited |
| **BM** | Build Margin |
| **CEA** | Central Electricity Authority |
| **CTE** | Consent to Establish |
| **CTO** | Consent to Operate |
| **$CO_2$** | Carbon dioxide |
| **DG** | Diesel generating set |
| **EIA** | Environment Impact Assessment |
| **FO** | Furnace Oil |
| **GHG** | Greenhouse gas |
| **GTG** | Gas turbine generation |
| **IPCC** | Inter Governmental Panel On Climate Change |
| **Kg** | Kilogram |
| **Km** | Kilometer |
| **kW** | Kilo watt |
| **kWh** | Kilo watt hour |
| **MW** | Mega watt |
| **MNES** | Ministry of Non Conventional Energy Sources |
| **OM** | Operating Margin |
| **PDD** | Project design document |
| **RLNG** | Re-gassified Liquified Natural Gas |
| **TPH** | Tons per hour |
| **UNFCCC** | United Nations Framework Convention on Climate Change |
| **WHRB** | Waste heat recovery boiler |

## Appendix B: List of References


- Kyoto Protocol to the United Nations Framework Convention on Climate Change
- Website of United Nations Framework Convention on Climate Change (UNFCCC), http://unfccc.int
- UNFCCC document: Clean Development Mechanism, Simplified Project Design Document For Small Scale Project Activities (SSC-PDD), Version 02
- UNFCCC document: Simplified modalities and procedures for small–scale clean development mechanism project activities
- UNFCCC document: Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories, Version 07, 28th November 2005
- UNFCCC document: Determining the occurrence of de-bundling
- Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual
- http://mnes.nic.in
- http://cea.nic.in/
- www.energymanagertraining.com
- www.cmaindia.org


- - - - -