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. • 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:

Installation of Cogeneration plant by utilizing the Biomass based Boiler with a capacity of 20 TPH at BIDCO Oil Refineries Limited, Kenya.

Version: 01
Date: 28/05/2011

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

Background of the company:

BIDCO, the largest edible oils refiner in East Africa, completed construction of its Crude Palm Oil (CPO) refinery in Thika, Kenya, in 1991. The facility is refining CPO imported from the Far East, to produce Palm oil, olein and stearin. The company also processes Corn Oils, Sunflower Oils and Soybean Oils.

Purpose of the Project Activity:

The purpose of the project activity is the installation of cogeneration plant i.e., the simultaneous generation of thermal and electrical energy using agricultural residues for captive use. The project activity aims to avoid the use of fossil fuels; in particular "Heavy fuel oil" to produce the electricity and steam required during the refining process and instead switches over to Biomass to meet the energy requirements. The project activity primarily involves installation of cogeneration plant with one 2.125 MW Turbine and 20 TPH, 67 kg/cm^2 biomass based boiler and associated accessories. Project activity uses primarily agricultural residues, specifically coffee, rice, macadamia and cashew husks and shells, as well as eucalyptus and acacia firewood.

BIDCO's switch to Biomass to meet its steam and electricity requirement has resulted in carbon emission reductions due to replacement of fossil fuels. Biomass is considered to be a carbon-neutral fuel because emissions from combustion are taken to completely offset by carbon captured (during photosynthesis) by the growing biomass.

Pre Project Scenario:

The Thika refinery unit has existing two Boilers of 8 TPH Capacity each installed in 1999. The Boilers are operating on Furnace Oil. Also PP has installed one biomass based Boiler of 16 TPH Capacity in 2006 considering the CDM revenue. This Boiler operates on agricultural residues. Steam demand for process was being met by running existing 16 TPH biomass based Boiler and two numbers of 8 TPH Furnace oil Boiler (if necessary) and Electrical demand from Kenya Power & Lighting Company (KPLC).

Project Activity Scenario

The project primarily involves installation of one new cogeneration plant with 2.125 MW turbine and one 20 TPH, 67 kg/cm^2 Biomass based Boiler. Hence, the project activity aims to avoid the use of furnace oil to produce the steam and electricity required during the refining process and instead switches over to Biomass to meet the energy requirements.

Baseline Scenario:

At the time of investment decision, PP evaluated continuation of Furnace oil based Boiler as an alternative to the project activity and found that this alternative is financially viable than the project activity. This alternative would not require any additional capital cost as the existing boilers were operational and had remaining life of 10 years. However, considering the fact that carbon revenue makes the project viable over the alternative, PP decided to go ahead with the implementation of the project activity.

Therefore, in the absence of the project activity, PP would have opted for Furnace oil based cogeneration system leading to CO_2 emissions.

Contribution of the Project Activity to Sustainable Development:

As per the National Environment Management Authority (Govt of Kenya) the following five indicators viz. Environmental, Social, Economical, Energy and Technological well being are considered as indicators for the sustainable development in its approved guidelines for CDM[1]

The project proponent believes that the project activity has a beneficial effect on the surrounding community, rural industries and the employment in the region and thereby project improves the social, environmental and the economic status of the surrounding community.

Environmental Sustainability:

- The project activity involves fuel switch from furnace oil to renewable biomass fuel which is considered as GHG neutral. Therefore in addition to reduced consumption of fossil fuel resources, the project activity leads to GHG emission reductions. The project activity neither impacts human health nor the biodiversity negatively.
- The use of agro residues as opposed to fuel oil from fossil sources results in a net reduction in particulate matter air pollution.
- On a broader spatial scale, if the use of biomass were to be replaced by its industry-standard petroleum-based substitute, fuel oil normally contains as much as 4% sulphur; replacement by biofuels reduces both SO_2 and NO_x emissions, thereby mitigating local and long-range acid deposition

Social Well Being:

[1] http://www.nema.go.ke/index2.php?option=com_docman&task=doc_view&gid=76&Itemid=35

- The project activity generates both skilled and unskilled employments opportunities, during the construction and operation of the plants.
- Manual firing and handling of biomass would require additional manpower compared to automated furnace oil boilers. This leads to employment generation in the local village

Economic Sustainability:

- Act as a clean technology demonstration project, one – if not the first – of its kind in Kenya, encouraging development of modern and more efficient cogeneration of electricity using biomass fuel throughout the Country;
- As opposed to a fossil fuel-fired plant, the project does not lead to an outflow of foreign exchange capital, since the biomass waste does not have to be imported.
- The project activity will contribute to the general improvement in the living standards of local people by generating additional employment opportunities.

Energy Sustainability:

- Diversify the sources of steam generation;
- Use of clean and efficient technologies, and conserve natural resources;

Technological well being:

- The project activity uses environmentally safe and sound technology. The project will encourage the replication of the technology in the sector.

Thus the project activity meets all the requirements for the sustainable developments in the host country.

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)
Government of Kenya (Host)	BIDCO Oil Refineries Ltd. (a Private entity)	No

BIDCO Oil Refineries Ltd. will be the sole owner of the CERs generated from the project activity.

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):

Kenya

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

East Africa / Great Lakes region

A.4.1.3. City/Town/Community etc:

Thika

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

BIDCO Oil Refineries Ltd. is located in the industrial zone near the town of Thika, 35 km north of the Kenyan capital, Nairobi. The closest major airport is Jomo Kenyatta International Airport. This airport has international and domestic flights from Nairobi, Kenya and is about 35 km from the center of Thika, Kenya.The latitude/longitude coordinates of the project site are: 1°03′06.76″ S, 37°05′09.00″ E. elev. 4880ft. The location is shown in the satellite image, below.

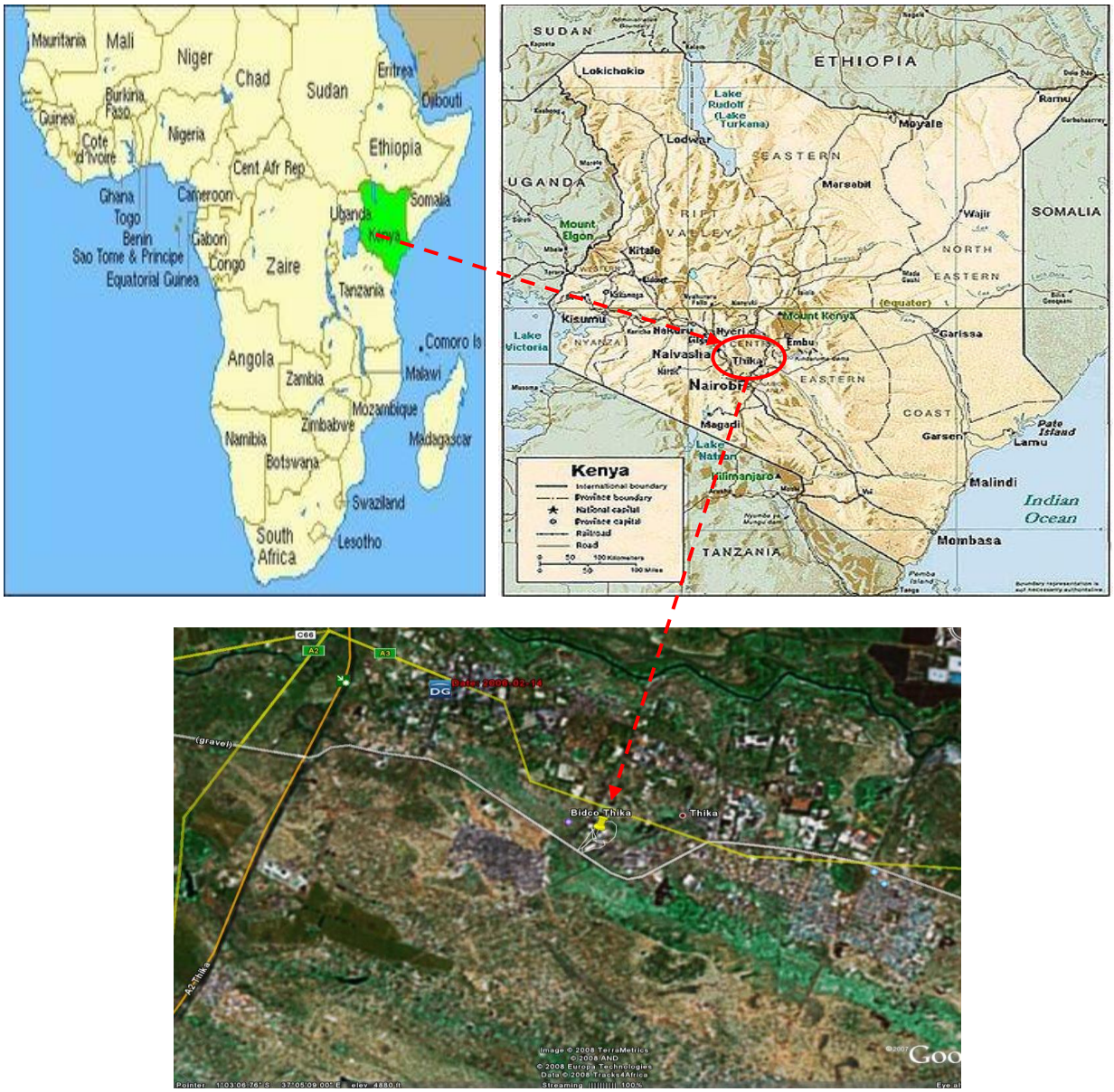


Figure 1: Location of the project activity

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

The project activity replaces the use of furnace oil for steam and electricity generation by renewable biomass.

As per simplified modalities and procedures for small scale CDM project activities, the project activity qualifies under the

Sectoral Scope : 01 Energy Industries (Renewable/Non-Renewable Sources)
Type-I : Renewable Energy Projects
Category C : Thermal energy production with or without electricity

Technical Specifications of the Project activity:

BIDCO proposed to install the cogeneration plant with the 20 TPH biomass based Boiler to be fired primarily by agricultural residues, specifically coffee, rice, macadamia, and cashew husks and shells, as well as eucalyptus and acacia firewood and 2.125 MW of turbine.

The project activity installs one 2.125 MW turbine and multi fuel fired boiler of 20 TPH, 67 kg/cm^2 and related machineries. The Main Boiler and the Balance of Plant (Auxiliaries) are manufactured by Thermax Ltd. The boiler will be operated by utilizing available agro-residues. The expected technical lifetime of the Boiler and Turbine is 20 years and 0 months.

Steam Boiler:

Parameter	Remarks
Steam generation Capacity	20 TPH
Model	POWERMAX (BDPG 200)
Boiler manufacturer (Make)	Thermax
Type	Pusher Grate Bidrum Boiler
Pressure of the Boiler	67 kg/cm^2
Temperature of the steam	460 ºC +/- 5 ºC
Feed water temperature	100 ºC
Enthalpy of feed water	419 kJ/kg
Enthalpy of steam	3319 kJ/kg
Efficiency of the Boiler	74 % +/- 2%
Life time of the Boiler	20 Years 0 months
Expected date biomass fuel boiler become operational	September 30, 2011

Steam Turbine:

Parameter	Remarks
Turbine Capacity	2.125 MW
Type	Back Pressure Turbine
Turbine Manufacturer (Make)	Thermax

Along with Boiler, other auxiliary machineries like Wood Chipper Machine, Air pre-heater, Draft fans, Motors, Ash handling system, Fuel handling system, Piping works, Electricals, Instrumentation & Control systems etc., are installed.

The biomasses for the project activity would be sourced from the nearby vendors. A total of 46,484 MT of the various fuels are to be combusted annually in 340 days of operation

The technology is environmentally safe and sound and it does not have negative impact on human health or biodiversity. No technology transfer is involved in the project activity from Annex I countries.

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

Years	Estimation of annual emission reductions in tonnes of CO_2e
2012	53,034
2013	53,034
2014	53,034
2015	53,034
2016	53,034
2017	53,034
2018	53,034
2019	53,034
2020	53,034
2021	53,034
Total estimated reductions (tonnes of CO_2 e)	530,340
Total number of crediting years	10
Annual average of the estimated reductions over the crediting period (tCO_2 e)	53,034

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

There is no public funding from the Annex I parties or diversion of Overseas Development Assistance (ODA) in the project activity. The total project cost is met by the project participant.

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

As per Appendix C, paragraph 2 of the Simplified Modalities and Procedures for Small-Scale CDM project activities states:

"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 proposed project activity is not a debundled component of a large scale project activity as there is no registered project activity or an application for registration by the same project participant and in the same category.

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:

As per the appendix B of simplified modalities and procedures for small scale project activities, the applied methodology for the CDM project activity is:

Type : AMS-I.C
Title : Thermal energy production with or without electricity
Sectoral Scope : 01
Version : 18
EB : 56

Reference: http://cdm.unfccc.int/methodologies/DB/H2PMYUBPE9H1DP9S0WB470N5EKU1NP

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

This project falls under the "Type I: Renewable energy projects" and "Category I C: Thermal energy production with or without electricity" as it displaces fossil fuels with biomass for generation of thermal and electrical energy.

Requirements with respect to technology/measure under AMS I.C – Thermal Energy production with or without electricity (Version 18) and its comparison for justification with the project activity are explained in the table below.

Sr. No	Applicability Criteria AMS I.C Version 18	Project Status	Remarks
1	This category comprises renewable energy technologies that supply users with thermal energy that displaces fossil fuel use. These units include technologies such as solar thermal water heaters and dryers, solar cookers, energy derived from	The project activity comprises of renewable biomass (agricultural residues, specifically coffee husk, rice husk, macadamia, and cashew husks and shells, as well as eucalyptus and acacia firewood[2]) based thermal energy generation by	Since the project activity involves renewable biomass based thermal and electrical energy generation that displaces fuel oil, the

[2] Since the biomasses being the byproducts of the industries agro industries, meet the definition of renewable biomass.

	renewable biomass and other technologies that provide thermal energy that displaces fossil fuel.	displacing the fuel oil. The steam generated in project activity is used for meeting the captive demand. In the absence of the project activity, the energy requirements would have been met by fuel oil based Boiler.	applicability condition is met.
2	Biomass-based cogeneration systems consisting of steam generator(s) and steam turbine(s) are included in this category. For the purpose of this methodology cogeneration shall mean the simultaneous generation of thermal energy and electrical energy in one process. Project activities that produce heat and power in separate element processes (for example, heat from a boiler and electricity from biogas engine) do not fit under the definition of cogeneration project.	The proposed project activity is Cogeneration plant which involves simultaneous generation of thermal and electrical energy to meet its power and steam demand by the installation of biomass based boiler and turbine.	Since the project activity is a cogeneration activity, the applicability condition is met.
3	Emission reductions from a biomass cogeneration system can accrue from one of the following activities: (a) Electricity supply to a grid; (b) Electricity and/or thermal energy (steam or heat) production for on-site consumption or for consumption by other facilities; (c) Combination of (a) and (b).	The cogeneration system supply electricity and thermal energy for on-site consumption of the refinery unit of BIDCO and hence option (b) is applicable	Since the project activity is a cogeneration system for captive use, the applicability condition is met.
4	The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal. (see paragraph 6 for the applicable limits for cogeneration project activities).	Based on the manufacturer's rated thermal output, the total installed thermal generation capacity is 16.11 MW thermal (Calculations are provided under this table).	Since the total installed thermal generation capacity is less than 45 MW thermal, this applicability condition is met.
5	For co-fired systems, the total installed thermal energy generation capacity of the project equipment, when using both fossil and renewable fuel shall not exceed 45 MW thermal (see paragraph 6 for the applicable limits for cogeneration project activities).	The project does not involve co-firing with fossil fuels.	Since the project is not a co-fire system, this condition is not relevant.

6	The following capacity limits apply for biomass cogeneration units. a. If the project activity includes emission reduction from both the thermal and electrical energy components, the total installed energy generation capacity (thermal and electrical) of the project equipment shall not exceed 45 MW thermal. For the purpose of calculating this capacity limit the conversion factor of 1:3 shall be used for converting electrical energy to thermal energy (i.e., for renewable project activities , the maximal limit of 15 MW(e) is equivalent to 45 MW thermal output of the equipment or the plant); b. If the emission reductions of the cogeneration project activity are solely on account of thermal energy production (i.e., no emission reductions accrue from electricity component), the total installed thermal energy production capacity of the project equipment of the cogeneration unit shall not exceed 45 MW thermal; c. If the emission reductions of the cogeneration project activity are solely on account of electrical energy production (i.e. no emission reductions accrue from thermal energy component), the total installed electrical energy generation capacity of the project equipment of the cogeneration unit shall not exceed 15 MW.	The emission reductions for the proposed project activity are from both the thermal and electrical energy components i.e. Option (a). The installed total thermal energy generation of the project activity is 16.11 MWth and the calculations are provided under this table. And the electrical energy generation capacity is 2.125 MW i.e., 6.375 MWth. Therefore the total installed energy generation capacity of the project activity is 22.49 MW_{th} which is lesser than 45 MW thermal. Hence the applicability condition is met.	Since the total installed thermal generation capacity is less than 45 MW thermal, this applicability condition is met.
7	In case electricity and/or steam/heat	The steam and electricity generated	Since the steam

	produced by the project activity is delivered to another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered into specifying that only the facility generating the energy can claim emission reductions from the energy displaced.	by the project activity is consumed onsite and not delivered to other facility.	generated is not transferred to a third party, this condition is not applicable.
8	Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category.	The proposed project activity has installed a new boiler and does not seek to retrofit or modify existing facility for renewable energy generation.	Since project activity does not retrofit or modify an existing facility, this condition is not applicable.
9	The capacity limits specified in the above paragraphs apply to both new facilities and retrofit projects. In the case of project activities that involve the addition of renewable energy units at an existing renewable energy facility, the total capacity of the units added by the project should comply with capacity limits in paragraphs 4 to 6 and should be physically distinct from the existing units.	The project activity is a new facility and confirms to the capacity limits of 45MW thermal. The project does not involve retrofication or capacity addition of renewable energy units at an existing renewable energy facility.	Since the project being a new facility confirms to the 45MW thermal limit, the condition is met.
10	Charcoal based biomass energy generation project activities are eligible to apply the methodology only if the charcoal is produced from renewable biomass sources provided: (a) Charcoal is produced in kilns equipped with methane recovery and destruction facility; or (b) If charcoal is produced in kilns not equipped with a methane recovery and destruction facility, methane emissions from the production of charcoal shall be considered. These emissions shall be calculated as per the procedures defined in the approved methodology AMS - III.K. Alternatively, conservative emission factor values from peer reviewed literature or from a registered CDM project activity	The proposed project activity uses agro-residues; it does not involve charcoal based biomass energy generation.	Since the project does not intend to use charcoal, this condition is not relevant.

	can be used, provided that it can be demonstrated that the parameters from these are comparable e.g., source of biomass, characteristics of biomass such as moisture, carbon content, type of kiln, operating conditions such as ambient temperature.		
11	If solid biomass fuel (e.g. briquette) is used, it shall be demonstrated that it has been produced using solely renewable biomass and all project or leakage emissions associated with its production shall be taken into account in emissions reduction calculation	The project activity will use renewable biomass residues and does not intend to use solid biomass fuels.	Since the project does not use solid biomass fuel, this condition is not relevant.

Small Scale Limit:

Based on the manufacturer's rated output, the calculations for the total thermal energy generated by the project activity are as follows:

S. No	Parameter	Value	Unit	Remarks
1	Steam Quantity	20	TPH	Technical specifications
2	Steam Pressure	67	kg/cm^2	Technical specifications
3	Enthalpy of steam at 67 kg/cm^2	3319	kJ/kg	Estimated based on standard steam tables
4	Enthalpy of feed water at 100^0C	419	kJ/kg	Estimated based on standard steam tables
5	Net energy output of the boiler	2900	kJ/kg	Calculated

At the Rated Capacity

Total thermal output: 2900 kJ/kg * 20 TPH= 58,004 MJ/h

Thermal output from the boiler: 58,004 MJ/h / 3600= 16.11 MW of thermal

Hence, Total thermal output of Agro-Residues based Boiler: 16.11 MWth.

The chosen methodology for the project, AMS I C is justifiable since the project activity meets all the applicability conditions as discussed above. Thus, it is used in the following sections of the PDD.

B.3. Description of the project boundary:

As per AMS IC, Project boundary constitutes of "*the physical, geographical site of the project equipment producing the renewable energy delineates the project boundary. The boundary also extends to the*

industrial, commercial or residential facility, or facilities, consuming energy generated by the system and the processes or equipment that is affected by the project activity."

Therefore, project boundary includes Biomass storage area, Steam generation Boilers and Turbine and related machineries as renewable energy generating system. The boundary extends to the refinery facility consuming the steam generated by the project.

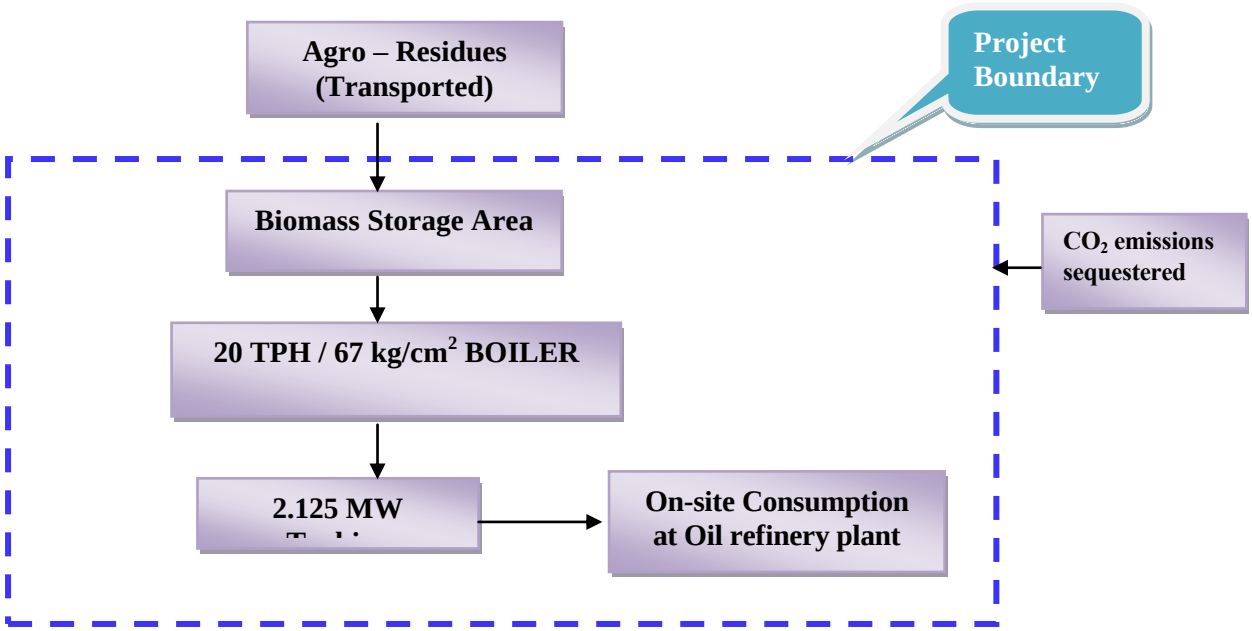


FIGURE 2: Project boundary

B.4. Description of baseline and its development:

The project activity involves renewable biomass based thermal and electrical energy generation. The renewable biomasses used in the project activity are agricultural residues, specifically coffee husk, and macadamia and cashew husks and shells as well as eucalyptus and acacia firewood.

The identification of the baseline scenario has been carried out in line with the Para 13 of AMS IC Version 18 which states that:

"For renewable energy technologies that displace technologies using fossil fuels, the simplified baseline is the fuel consumption of the technologies that would have been used in the absence of the project activity times an emission factor for the fossil fuel displaced. For calculating the emission factor, reliable local or national data shall be used. IPCC default values shall be used only when country or project specific data are not available or demonstrably difficult to obtain."

The project activity has come up to meet the steam and electricity demands of BIDCO's crude palm oil (CPO) refining process plant. During the decision making, PP had evaluated continuation of fuel oil based cogeneration system of similar capacity as an alternative to the project activity. PP evaluated the

financial viability (in terms of levelised cost) of both the systems and found that fuel oil based co-generation system is financially viable than the project activity.

Since PP had assessed an option of fuel oil based Boiler at the investment decision time, in the absence of project activity, fuel oil based Boiler of 20 TPH/67 kg/cm^2 and 2.125 MW Turbine would have been installed to meet the steam and electricity demands. In line with the Para 48 (b) of Simplified modalities and procedures for small scale CDM projects, the baseline demonstration has been further strengthened by comparing the levelised cost of fuel oil and biomass based co-generation system in section B.5.

Alternative 1: Fuel oil based co-generation system

In the absence of the CDM project activity, the steam and electricity requirements would have been met from fossil fuel (fuel oil) based plant. This alternative is in compliance with all applicable legal and regulatory requirements and may be a part of the baseline.

Alternative 2: Renewable Biomass based co-generation system (i.e. project activity taken without CDM benefits)

BIDCO shall utilise agro fuel like coffee husk, woodchips, etc., as a fuel to meet the steam and electricity requirements. This alternative is in compliance with all applicable legal and regulatory requirements. Hence this alternative is considered further for arriving at the baseline scenario.

The above real and credible alternative in the absence of project activity has been assessed in below table (refer Section B.5 of PDD and financial models for detailed calculations):

Alternatives	Levelised Cost of energy generation (USD/GJ)[3]
Fuel oil based co-generation system	10.18
Renewable Biomass based co-generation system (i.e. project activity taken without CDM benefits)	11.28

From the financial results presented above and in detailed analysis in section B.5, it becomes clear that the levelised cost of biomass based co-generation system is higher than the levelised cost of fuel oil based co-generation system.

It can be concluded from the above results that alternative 2 i.e. *"Renewable Biomass based co-generation system"* is not financially attractive as alternative scenario 1 i.e. *"Fuel oil based co-generation system"*. The assumptions considered for both the alternatives financial analysis are detailed in section B.5.

Hence, the most economically attractive course of action, i.e. fuel oil based co-generation system has been considered as baseline scenario.

[3] Relevant calculation and references are submitted to DOE

Emission reduction is achieved by substituting heavy fuel oil with Biomass, specifically agricultural residues and plantation fuel wood. The baseline emission corresponding to energy generation has been estimated using the emission coefficient for fuel oil. The baseline emissions have been computed on the basis of amount of fuel oil required generating 20TPH of steam and 2.125 MW of electricity supplied to the process over 340 days.

As per equation 3 of AMS IC Version 18, the baseline emissions are calculated using the following formula:

$$BE_y = BE_{cogen,\,CO2,\,y} = [(EG_{PJ,\,thermal,\,y} + EG_{PJ,\,electrical} * 3.6) / \eta_{BL,\,cogen}] * EF_{Coal,\,CO2}$$

The following table illustrates the key parameters and assumptions used to determine the baseline emissions.

Key Parameter	Description	Value	Data Source
EG_y	Total energy generation	654 TJ/Annum	Estimated
$EF_{FF,\,CO2}$	Emission Factor of Fuel oil	77.4 tCO_{2e} / TJ	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy; Table 2.2, Page Num 16
$NCV_{Fuel\ oil}$	Net Calorific Value of Fuel oil	9600 kCal/kg	As per the quotes from Suppliers
$\eta_{BL,thermal}$	Efficiency of baseline (fuel oil) boiler	100	Default Efficiency as per Para 26c of the applied methodology

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:

The project activity by BIDCO is substituting the use of heavy fuel oil by using renewable Biomass to meet the internal thermal and electrical energy requirements with the primary aim of reducing carbon dioxide emissions by fossil fuels.

For small-scale CDM project activities, additionality needs to be demonstrated using Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities. As per Attachment A to Appendix B, PP has to demonstrate additionality due to at least one of the following barriers:

1. Investment barrier
2. Technological barrier
3. Barrier due to prevailing practice
4. Other barriers

PP has chosen to prove the additionality using **investment barrier.**

Investment Barrier:

It is proposed to use Investment Comparison analysis as it derives economic benefits from the project activity by generation and use of thermal and electrical energy. The Investment comparison analysis has been carried out by calculating the levelized cost of energy generation (USD/GJ) for the alternatives

1) Renewable biomass based Co-generation system (without CDM)
2) Fuel oil based Co-generation system

As per Guideline 16 of Annex 58 ("Guidance on the Assessment of Investment Analysis-Version 03") of EB 51 Report, the investment comparison analysis can be applied to those cases only if the baseline scenario leaves the project proponent no other choice than to make an investment to supply the same (or substitute) products or services. We, in view of the above, would like to submit that the investment in steam and electricity generation projects is necessary for PP to meet the energy demand of the CPO refinery. Hence, the project proponent has the only option to invest in co-generation project anyhow to meet the captive demands.

As per Guidance 16, "In cases where the alternative requires investment anyhow and baseline emissions are based on that alternative, the only means of determining that the project activity is less financially attractive than at least one alternative is to conduct an investment comparison analysis" As this condition is applicable to the project activity, the investment comparison approach is therefore suited for the proposed CDM project activity.

As explained above, PP has to make investment anyhow to generate thermal and electrical energy to meet its captive demands. Also, as there is no direct revenue source from the project activity in terms of sale of energy to third party, financial indicators like IRR, NPV and Cost benefit ratio are not applicable as the objective of BIDCO is to generate thermal and electrical energy that is reliable and economical to run its refinery. The cost of energy generation and other utilities directly reflect in the production cost of palm oil and hence objective is to keep these at minimum to be competitive in the market. The levelized cost of energy generation (USD/GJ of energy) is the most suitable financial indicator for this decision making context.

List of assumptions used in the financial analysis for Project activity and Baseline alternative:

Parameter	Unit	Project activity	Baseline Scenario	Remarks
Technical Parameters:				
No. of operating days	Days	340	340	Assumed
Running Hours	hrs/annum	8160	8160	Assumed for 340 days per annum
Steam Rate	TPH	20	20	As per the offer letter and design parameters of the Boiler dated 19/07/2010
Steam Pressure	kg/cm^2	67	67	As per the Offer Letter dated 19/07/2010
Enthalpy of feed water @ 100°C	kJ/kg	419	419	Estimated using steam table values for 100°C at inlet to boiler
Enthalpy of steam @ 67	kJ/kg	3319	3319	Estimated using steam table

kg/cm^2 and 460 Deg C				values
Efficiency of Furnace oil fired Boiler	%	-	100%	Default Efficiency as per Para 26c of the applied methodology
Efficiency of Biomass based Boiler	%	76%	-	As per the supplier quotation
Life time	Years	20	20	As per the Offer Letter
Fuel Parameters:				
Furnace Oil Calorific value – NCV	kCal/kg	-	9600	As per the supplier quotation
Biomass Calorific value – NCV	kCal/kg	3200	-	As per the supplier quotation
Fuel oil requirement	MT/Year	-	15,495	Estimated
Biomass requirement	MT/Year	46,484	-	Estimated
Average Cost of Fuel oil	USD/ton	-	331	As per the supplier quotation
Average Biomass Purchase cost	USD/ton	91	-	Calculated as per supplier quotations
Financial Parameters:				
Total Project Cost	USD	1517000	750,000[4]	As per the Offer Letter
IT Depreciation	%	12.5	12.5	As per the Income tax Act, Chapter 470, Page Num 173[5]
Income tax	%	30	30	As per Income tax act
Discount Factor (WACC)	%	14.29%	14.29%	As per rates prevailing at the time of investment decision
Operation and Maintenance (% of Capital Cost)	%	3.5	3.5	As per Internal Memorandum
Yearly Price Escalation on O & M	%	5	5	As per Internal Memorandum

The levelized cost of energy generation calculated based on above assumptions is:

Alternatives	Levelised Cost of energy generation (USD/GJ)[6]
Fuel oil based Co-generation system	10.18
Renewable Biomass based Co-generation system (i.e. project activity taken without CDM benefits)	11.28

From the above table it can be concluded that fuel oil based co-generation is financially attractive option than the renewable biomass based co-generation system. However, on consideration of CDM revenue and the environmental benefits the biomass based alternative becomes financially viable.

[4] Considered the residual value of 1999 commissioned F/O Boiler after depreciation

[5] http://www.revenue.go.ke/incometax/pdf/IncomeTaxAct2004.pdf

[6] Relevant calculation and references are submitted to DOE

Sensitivity analysis:

To substantiate the robustness of the results obtained above the sensitivity analysis has been conducted. As per "Guidelines on the assessment of investment analysis", Version 03 Annex 58 of EB 51 meeting report, the criteria for choosing the sensitivity analysis parameter is:

Guidance: *Only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude), and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets.*

The most crucial parameters of the project activity like Capital cost, O&M cost and Fuel cost that can affect the levelised cost are subjected to the sensitivity analysis. The reasons for subjecting the parameters to the sensitivity analysis are explained below:

The following parameters which can affect ±20% of the project cost or Revenue is:

1. Capital cost
2. O&M Cost
3. Fuel Cost

Range of variation of chosen parameters:

The sensitivity analysis was carried on Levelised cost of energy generation varying the above selected parameters by ±10% following the guideline provided by EB in meeting no. 41 annex 45.

The result of the project is presented in table 1 below.

Table 1: Sensitivity analysis

Variable parameters	% Variation	Levelised Cost of energy generation for Biomass based Co-generation (USD/GJ)	Levelised Cost of energy generation for Fuel oil based Co-generation (USD/GJ)
Capital cost	-10%	11.25	10.17
	+10%	11.30	10.19
O&M Cost	-10%	11.26	10.17
	+10%	11.29	10.18
Fuel Cost	-10%	10.17	9.17
	+10%	12.38	11.19

The levelised cost of energy generation from biomass based co-generation as evident is quite high as compared to that from fuel oil based co-generation. Hence, CDM revenues are very indispensable for the project activity and will help the project to become financially viable.

Therefore, it can be concluded that the proposed project activity without being registered as CDM project is financially not viable activity.

Prior CDM consideration and real-continuous CDM action:

The start date of the project activity is date of placing purchase order for Boiler and other related machineries to Thermax Ltd which is 15/09/2010. Thus, as per Para 2 of Annex 22 of EB49, the project is a new project activity. For new project activity, prior consideration of CDM has to be demonstrated by intimating UNFCCC and Host Government (NEMA) about PP's intention to seek the CDM benefits within the six months of the starting date.

PP had intimated UNFCCC and Host Government (NEMA) about its intention to seek CDM benefit for the project activity on 31/01/2011[7]. Thus, PP meets the condition given in Para 2 and has considered CDM prior to the start of the project activity.

The chronological events of the project implementation and real-continuous actions to seek CDM benefits are shown in the table below.

Date	Project Execution Step	CDM registration efforts	Evidence
19/07/2010	Offer letters received for Biomass based Boilers from Thermax Limited		Letters from equipment Suppliers dated 19/07/2010
10/08/2010	BIDCO approves for the development of the biomass based Co-generation project.	Board considered CDM revenue for financial viability	Extracts of the minutes of Board meeting
15/09/2010	Initial Purchase order placed for the Boilers in the project activity.	**CDM Starting Date**	Letter from BIDCO to Boiler Suppliers dated 15/09/2010
Oct to Dec 2010		Local Stakeholders Survey for CDM conducted	Copy of Stakeholders survey forms
16/11/2010	-	Contracted CDM Consultant for PDD services	Copy of the Agreement
31/01/2011	-	Prior Consideration letter to UNFCCC and NEMA	E-mail communication dated 31/01/2011
28/04/2011	-	Proposal from DOE for Validation services	Copy of email communication
25/05/2011	-	Agreement with DOE	Copy of the Agreement

[7] Email communication with UNFCCC and NEMA.

		for validation services	
28/05/2011	-	Submission of PDD for Webhosting	Email Copy
30/09/2011	Expected Commissioning dates of the project activity plant		Commissioning Certificates

From the above chronology table, it is clear that gap between two CDM related activities are not greater than two years. The PP has demonstrated the prior CDM awareness and within 5 months of the CDM starting date, CDM consultant was contracted and other CDM related activities also happened parallel with the implementation. The documented evidence for the same shall be provided to DOE.

Hence, the project activity has met the applicability criteria 8a of Annex 22 of EB49. Therefore, it can be concluded that continuing and real actions were taken to secure CDM status for the project in parallel with its implementation and the gap between the CDM related activities is also less than 2 years.

Thus, the project activity proves to be additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The proposed project activity is the installation of biomass based co-generation system uses renewable energy sources like wood chips, coffee Husk etc., that produces steam and displaces fossil fuel (Fuel Oil) used for thermal energy generation. Hence the baseline emissions is as per Para 23 of the methodology AMS I.C, Version 18, EB 56.

Emission reductions are calculated as follows:

Emission reductions (ER_y):

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y Emission reductions in year *y* (t CO_2e)
BE_y Baseline emissions in year *y* (t CO_2e)
PE_y Project emissions in year *y* (t CO_2)
LE_y Leakage emissions in year *y* (t CO_2)

Baseline Emissions:

$$BE_{cogen,CO_2,y} = [(EG_{PJ,thermal,y} + EG_{PJ,electrical,y} * 3.6) / \eta_{BL,cogen}] * EF_{FF,CO_2}$$

Where:

$\mathbf{BE_{cogen,CO2,y}}$	Baseline emissions from electricity and thermal energy displaced by the project activity during the year *y*; tCO_2e
$\mathbf{EG_{PJ,electrical,y}}$	The amount of electricity supplied by the project activity during the year *y*; GWh
$\mathbf{EG_{PJ,thermal,y}}$	The net quantity of thermal energy supplied by the project activity during the year *y*; TJ
3.6	Conversion factor; TJ/GWh
$\mathbf{\eta_{BL,cogen}}$	The total annual average efficiency of the cogeneration plant using fossil fuel determined in accordance with paragraphs 24 and 25. As per Para 26 c, PP has used the default efficiency of 100%.
$\mathbf{EF_{FF,CO2}}$	The CO_2 emission factor of the fossil fuel that would have been used in the baseline cogeneration plant; tCO_2/TJ obtained from reliable local or national data if available, otherwise IPCC default emission factors are used. PP has used IPCC default value 77.4 tCO_2/TJ for fuel oil.

Project Emissions:

As per para 43 of applied approved small scale methodology, AMS I.C, the project emissions include:

a) *CO_2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of 'Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion'.*

b) *CO_2 emissions from electricity consumption by the project activity using the latest version of Tool to calculate baseline, project and/or leakage emissions from electricity consumption;*

c) *Any other significant emissions associated with project activity within the project boundary;*

d) *For geothermal project activities, project participants shall account for the following emission sources, where applicable: fugitive emissions of carbon dioxide and methane due to release of non-condensable gases from produced steam; and, carbon dioxide emissions resulting from combustion of fossil fuels related to the operation of the geothermal power plant.*

For the proposed project activity, the project emission could be only from the on-site consumption of fossil fuels due to the project activity and emissions due to collection/processing/transportation of biomass residues to the project site will be considered as the project emissions since all the other conditions that are mentioned are not applicable.

The project emissions from fossil fuel combustion shall be calculated using the latest version of Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion. Also, the consumption of fossil fuels will be monitored whenever there is not adequate supply of renewable biomass/agro-residues.

The project emissions would be calculated as per the below formula:

CO_2 emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

As per equation 1 of the "*Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion";*

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y}$$

Where:

$PE_{FC,j,y}$ = Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr);

$FC_{i,j,y}$ = Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr);

$COEF_{i,y}$ = Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)

i = Are the fuel types combusted in process j during the year y

The CO_2 emission coefficient $COEF_{i,y}$ can be calculated using one of the following two Options (A & B), depending on the availability of data on the fossil fuel type i, as follows:

PP has chosen option B

Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows: Equation 4:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where:

$COEF_{i,y}$ = Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)

$NCV_{i,y}$ = Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)

$EF_{CO2,i,y}$ = Is the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)

i = Are the fuel types combusted in process j during the year y

Leakage Emissions:

As per Para 45 and 46 of the applied approved methodology AMS I.C., the leakage is to be considered:

- *If the energy generating equipment is transferred from another activity, leakage is to be considered.*

There is no transfer of energy generating equipment from another activity, hence leakage is not considered and has been fixed ex-ante.

- *In case collection/processing/transportation[8] of biomass residues is outside the project boundary, CO_2 emissions from collection/processing/transportation of biomass residues to the project site.*

The project activity involves the transportation of biomass residues from outside the project boundary. As per para 46 of AMS I.C, Version 18, if biomass residues are transported over a distance of more than 200 kilometres due to the implementation of the project activity then this leakage source attributed to transportation shall be considered, otherwise it can be neglected. But the project activity involves the transportation of biomass residues within 200 kilometres and hence the leakage emissions are neglected.

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

Data / Parameter:	**$EF_{FF,CO2}$ - Fuel Oil**
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor of the fossil fuel type (Fuel oil) that has been identified as the most likely baseline scenario
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy; Table 2.2, Page Num 16
Value applied:	77.4
Justification of the choice of data or description of measurement methods and procedures actually applied :	The methodology allows (AMS I.C, Ver. 18, Para 13) that value can be obtained from reliable local or national data if available; otherwise IPCC default emission factors are used. Hence we have chosen to obtain the value from 2006 IPCC Guidelines for National Greenhouse Gas Inventories.
Any comment:	--

Data / Parameter:	**$\eta_{BL,cogen}$**
Data unit:	%
Description:	The efficiency of the plant using fossil fuel that would have been used in the absence of the project activity.
Source of data used:	Default Efficiency
Value applied:	100%
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per Para 26 c of AMS I.C, Version 18 , default efficiency of 100% is used for ex-ante emission reduction calculation purposes.
Any comment:	--

Data / Parameter:	**$SEC_{biomass}$**
Data unit:	TJ of Biomass input energy /TJ of energy output

[8] If biomass residues are transported over a distance of more than 200 kilometres due to the implementation of the project activity then this leakage source attributed to transportation shall be considered, otherwise it can be neglected.

Description:	Specific fuel consumption of biomass
Source of data to be used:	Calculated based on design parameters of biomass consumption and energy output
Value of data	1.32
	As per paragraph 40 of the Indicative simplified baseline and monitoring methodology I-C, Version 18, "*In the case of project activity consuming biomass and fossil fuel to produce thermal and or electrical energy, specific energy consumption of each type of fuel (biomass or fossil) to be used shall be specified ex ante. The consumption of each type of fuel shall be monitored".* In accordance with the methodology, the specific fuel consumption of Biomass has been stated ex ante and the detailed calculation is provided in levelised cost analysis sheet.
Any comment:	This data is calculated based on the total quantity of biomass consumed, calorific value and the enthalpy of steam (at both operating conditions). This data is provided ex-ante. The actual quantity of each type of biomass used will be monitored ex-post; details of which are provided in Section B.7.1.

Data / Parameter:	$Q_{Biomass\ available}$
Data unit:	Tonnes/Annum
Description:	Quantity of surplus biomass available in the region
Source of data to be used:	As per biomass assessment survey report
Value of data	--
Justification of the choice of data or description of measurement methods and procedures actually applied :	Report prepared by the reputed third party consultant based on the Publicly available information on the annual generation of biomass.
Any comment:	--

B.6.3 Ex-ante calculation of emission reductions:

Emission reductions (ER_y)

$ER_y = BE_y - PE_y - LE_y$

$=53,034 – 0 – 0$

$=53,034\ tCO_2e/year$

Baseline Emissions:

$$BE_{cogen,CO_2,y} = [(EG_{PJ,thermal,y} + EG_{PJ,electrical,y} * 3.6) / \eta_{BL,cogen}] * EF_{FF,CO_2}$$

$EG_{PJ,thermal,y}$ = (2900 kJ/kg * 20 TPH * 1000 kg)

= 623 TJ/Annum

$\eta_{BL, cogen}$ = 100%

$EF_{FF, CO2}$ = 77.4 tCO_2/TJ

$EG_{PJ,electrical,y}$ = (2.125 MW * 8160 hrs) / 1000

= 17 GWh

$BE_{cogen, CO2, y}$ = (623 TJ/Annum + 17 GWh * 3.6 / 100 %) * 77.4 tCO_2/TJ

= 53,034 tCO_2e/ year

Project Emissions:

For ex-ante emission reduction calculations, fossil fuel consumption in the project activity has been considered as zero. Also, the consumption of any fossil fuels would be monitored whenever there is not adequate supply of renewable biomass/agro-residues. The provision to monitor the same has been provided in section B.7.1 of the PDD.

PE_y = 0 tCO_2e/year

Leakage Emissions:

LE_y = 0 tCO_2e/year

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

Year	Estimation of project activity emissions (tCO_2 e)	Estimation of baseline emissions (tCO_2 e)	Estimation of leakage (tCO_2 e)	Estimation of overall emission reductions (tCO_2 e)
2012	0	53,034	0	53,034
2013	0	53,034	0	53,034
2014	0	53,034	0	53,034
2015	0	53,034	0	53,034
2016	0	53,034	0	53,034
2017	0	53,034	0	53,034
2018	0	53,034	0	53,034
2019	0	53,034	0	53,034
2020	0	53,034	0	53,034
2021	0	53,034	0	53,034
Total (tonnes of CO_2e)	0	530,340	0	530,340

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**Continuous operation of the equipment/system**
Data unit:	--
Description:	Continuous operation of the equipment/system
Source of data to be used:	-
Value of data	--
Description of measurement methods and procedures to be applied:	Monitoring: Manual inspection of the operation of the equipments to ensure that they are still operating. Data type: Monitored and Archived Archiving Procedure: Paper Recording Frequency: Annually Responsibility: Shift in charge.
QA/QC procedures to be applied:	The senior manager would cross check the data.
Any comment:	Data archived will be kept 2 years beyond the crediting period

Data / Parameter:	**Annual operating hours**
Data unit:	Hours
Description:	Number of hours of operation of the project activity in year y
Source of data to be used:	Plant records
Value of data	8160
Description of measurement methods and procedures to be applied:	Monitoring: The boiler operator will be recording the daily hour of operations. This will be aggregated annually Data type: Monitored and Archived Archiving Procedure: Paper Recording Frequency: Daily, aggregated annually Responsibility: Boiler operator
QA/QC procedures to be applied:	Shift in-charge will cross check the data.
Any comment:	Data archived will be kept 2 years beyond the crediting period

Data / Parameter:	**$EG_{PJ,thermal}$**
Data unit:	TJ
Description:	Net quantity of thermal energy supplied by the project activity
Source of data to be used:	Calculated
Value of data	623
Description of measurement methods and procedures to be applied:	Calculation procedure: Enthalpy of steam from Boiler is calculated from steam tables based on the corresponding pressure and quantity of steam. The net energy content of steam generated from the project activity (TJ) is then obtained as a product of the

	total steam generated and the enthalpy of steam. Data type: Calculate and archived Archiving procedure: Paper and Electronic Recording Frequency: Hourly steam quantity and pressure to get monthly average enthalpy Responsibility: Boiler operator would be responsible for monitoring and checks for regular calibration of steam flow meters and pressure gauge and Shift in charge will be responsible for the calibration of steam flow meters.
QA/QC procedures to be applied:	QA/QC procedures will be ensured as the steam flow meters would be calibrated at regular intervals.
Any comment:	Data archived will be kept 2 years beyond the Crediting period

Data / Parameter:	$EG_{PJ,electrical}$
Data unit:	GWh/year
Description:	Net electricity supplied by the project activity
Source of data to be used:	Electronic meter at the plant site
Value of data	17
Description of measurement methods and procedures to be applied:	Monitoring: Electricity meter in control room will measure the net quantity of electricity supplied by the project activity for process. Data type: Measure Recording Frequency: Daily Archiving procedure: Paper and Electronic Responsibility: Turbine operator would be responsible for monitoring and checks for regular calibration of electricity meter and Shift In-charge will be responsible for calibration of the electricity meters. Calibration Frequency: Once in a year
QA/QC procedures to be applied:	QA/QC procedures will be ensured as the electricity meters would be calibrated at regular intervals.
Any comment:	The auxiliary consumption of 5% is adjusted in the gross generation to get the net electricity. Data archived: Crediting period + 2 yrs

Data / Parameter:	Q_{Steam}
Data unit:	TPH
Description:	Quantity of steam supplied by the Boiler
Source of data to be used:	Measured data at the plant site by Steam flow meter
Value of data	20
Description of measurement methods and procedures to be applied:	Monitoring: Steam flow meters are installed at the boiler outlet will monitor the total quantity of steam supplied for process. Data type: Measured and archived. Archiving procedure: Paper and Electronic

	Meter: Steam flow meter Accuracy class: 0.2% Recording Frequency: Hourly Calibration Frequency: Once in a year Responsibility: Boiler operator would be responsible for monitoring and checks for regular calibration of steam flow meters and Shift In-charge will be responsible for calibration of the steam flow meters.
QA/QC procedures to be applied:	QA/QC procedures will be ensured as the steam flow meters would be calibrated at regular intervals.
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	**Pressure**
Data unit:	kg/cm^2
Description:	Pressure of steam at the outlet of boiler
Source of data to be used:	Pressure gauge
Value of data	67
Description of measurement methods and procedures to be applied:	Monitoring: Pressure gauge will measure the pressure of the steam at the boiler outlet Data type: Measured and archived Recording Frequency: Hourly Archiving procedure: Paper and Electronic Responsibility: Boiler operator would be responsible for monitoring and checks for regular calibration of pressure gauge and Shift In-charge will be responsible for calibration of the pressure gauge. Calibration Frequency: Calibration will be carried out at regular intervals
QA/QC procedures to be applied:	QA/QC procedures will be ensured as the pressure gauge would be calibrated at regular intervals.
Any comment:	The data will be daily monitored. The data is required to calculate enthalpy of steam at the Boiler. Data archived will be kept 2 years beyond the Crediting period

Data / Parameter:	$\mathbf{B}_{\mathbf{Biomass,y}}$
Data unit:	MT/Annum
Description:	Quantity of Biomass used in the project activity per Annum
Source of data to be used:	1. Invoices 2. Plant records
Value of data	46,484
Description of measurement methods and procedures to be applied:	Monitoring: Weigh bridge at plant entry would record the total quantity of different biomass residue to be used and the same would be confirmed with the invoices raised by the biomass suppliers Data Type: Measured and Archived Archiving Procedure: Electronic and Paper Recording frequency: Annually Responsibility: Plant head with Officer (Stores) would be responsible for

	monitoring and checks for regular calibration of the weigh bridge and maintaining the copy of invoices received on a regular basis
QA/QC procedures to be applied:	QA/QC procedures will be ensured since the equipment would be calibrated at regular intervals.
Any comment:	Data archived will be kept 2 years beyond the Crediting period

Data / Parameter:	$NCV_{biomass}$
Data unit:	kcal/kg
Description:	Net calorific value of biomass
Source of data to be used:	Third party lab records for monthly tests
Value of data	3,200
Description of measurement methods and procedures to be applied:	Monitoring: The calorific value analysis will be conducted by the competent third party and the same would be confirmed with the invoices raised by the biomass suppliers Data Type: Calculated and Archived Archiving Procedure: Paper Recording frequency: Monthly Responsibility: Plant head along with Officer (Stores) would be responsible for monitoring
QA/QC procedures to be applied:	--
Any comment:	Data archived will be kept 2 years beyond the Crediting period

Data / Parameter:	$NCV_{i,y\ Fossil\ fuel}$
Data unit:	kcal/kg
Description:	Net calorific value of fossil fuel type *i* used in the project activity
Source of data to be used:	Plant Records.
Value of data	--
Description of measurement methods and procedures to be applied:	Monitoring: The calorific value of fossil fuel type *i* used in the boilers will be calculated and the same will be crosschecked with the purchased fossil fuel bills. Data Type: Calculated and Archived Archiving Procedure: Paper Recording frequency: Monthly Responsibility: Plant head along with Officer (Stores) would be responsible for monitoring
QA/QC procedures to be applied:	--
Any comment:	Data archived will be kept 2 years beyond the Crediting period

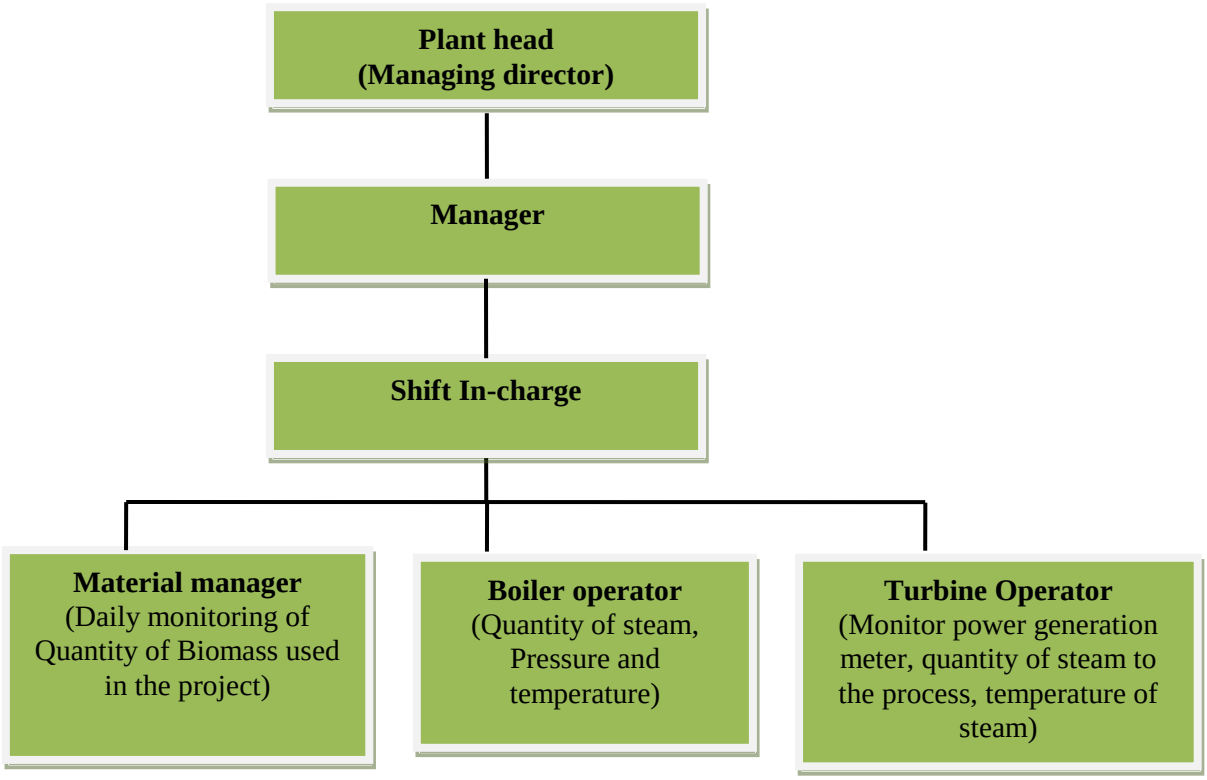
Data / Parameter:	$Q_{fossil\ fuel\ ,i,\ y}$

Data unit:	Tonnes/Annum
Description:	Quantity of fossil fuel type *i* used in the project activity
Source of data to be used:	Plant records
Value of data	--
Description of measurement methods and procedures to be applied:	Monitoring: The quantity of fossil fuel type *i* used in the project activity will be calculated and the same will be crosschecked with the purchased fossil fuel bills. Data Type: Calculated and Archived Archiving Procedure: Paper Recording frequency: Monthly Responsibility: Plant head along with Officer (Stores) would be responsible for monitoring.
QA/QC procedures to be applied:	--
Any comment:	Data archived will be kept 2 years beyond the Crediting period

Data / Parameter:	**Moisture Content $_{biomass}$**
Data unit:	%water
Description:	Moisture content of the biomass residues
Source of data to be used:	Moisture analysis in the in-house laboratory
Value of data	--
Description of measurement methods and procedures to be applied:	Monitoring: The moisture content of a batch of biomass residues will be measured in the in-house laboratory once in a month. Weighted average will be used for the calculations. Batch having homogenous quality will be selected. Data Type: Measured and archived Archiving Procedure: Paper Recording Frequency: Once in a month Responsibility: Lab technician will be analysing the moisture content of a batch of biomass residues using a standard method.
QA/QC procedures to be applied:	A sample of biomass residues from a batch having homogenous quality will be given in the external lab for moisture testing once in three months.
Any comment:	Data archived will be kept 2 years beyond the crediting period

B.7.2 Description of the monitoring plan:

The Managing Director (MD) of BIDCO has constituted the CDM project team, which is responsible for the project activity. The team is responsible for monitoring, verification and recording of the data.



Roles and responsibilities:

Plant Head:

- The Managing Director would head the CDM team and will be responsible for compliance with CDM related matters and ensure to follow the plan.

Manager:

- The Manager would manage the CDM team and will be responsible for compilation and checking of all the results.

Shift In-charge:

- Implementing the monitoring procedures lay down
- Ensure calibration of meter reading

Material manager:

- Daily recording of the biomass used in the project activity.

Boiler operator:

- Maintenance of the boiler and its metering equipments
- Daily recording of the meter equipments (like pressure, temperature, quantity of steam) in the log book

Turbine operator:

- Daily record the electricity generation from the electronic meter in the log book

The detailed monitoring plan is provided in Annex 4.

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

Name of the responsible entity for applying baseline study and the monitoring methodology to the project activity and its contact information:

BIDCO Oil Refineries Ltd, Kenya

This is a project participant (contact details are given in Annex 1)

Date of completion of baseline Study: 05/12/2010

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:

15/09/2010, this start date is Purchase order date of major equipment i.e. Boiler for the proposed project activity

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

20 years 0 Months

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

Fixed crediting period of 10 years is chosen

C.2.1. Renewable crediting period

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:

01/01/2012 or the date of registration (whichever is later)

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 EIA report has been submitted to the National Environmental Management Authority, Kenya's DNA and the Host Party. As biomass waste will be used for energy generation with efficient combustion, there are no significant environmental impacts of the project activity.

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:

There was no significant environmental impacts assessed by the project participants and no trans-boundary effect was envisaged. This is in accordance with the local and country level pollution regulations.

However, the project activity has obtained all the necessary environmental, technical and legal clearances and has been regularly renewing the clearances whenever required.

SECTION E. Stakeholders' comments

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

The local stakeholders are identified as the people living in the villages in vicinity of the BIDCO refinery. The comments are received by the survey through following questionnaire. The actual survey was conducted in local language as well as in English. The Local stakeholder's survey was carried out in the month of October to December 2010.

Survey form for cogeneration plant with one 2.125 MW Turbine and 20 TPH Boiler at BIDCO refinery unit in Thika, Kenya

You are aware of the BIDCO's oil refinery unit operating in your neighbouring area. The BIDCO Oil Refineries Ltd has proposed to implement the renewable biomass based co-generation project at its Crude Palm Oil (CPO) refinery unit in Thika, Kenya. The renewable biomasses like coffee husk, firewood, etc., would be used in the project. The steam and electricity generated by the project will be consumed internally.

Through the implementation of this project, BIDCO Oil Refineries Ltd will be displacing the GHG emissions that would have occurred due to the Fuel oil combustion. Thus, the project is leading to CO_2 emission reductions generating environmental sustainability. BIDCO Oil Refineries Ltd has undertaken this project as Clean Development Mechanism project. This survey is a step towards the registration of the project under Clean Development Mechanism of the Kyoto Protocol. You are requested to fill your response in the following questionnaire.

Name: …… Location: ……

Occupation: …… Education: …….

Sr. No.	Question	Response
1	Is your environment affected by the project?	
2	Is there any environmental / social problem due to biomass collection and transportation to project site?	
3	Does the project have any negative impact on human health or biodiversity?	
4	Has the employment increased due to the project?	
5	Has your livelihood negatively affected by the project?	
6	What are the benefits from the project?	
7	Any other comments and suggestions?	

Signature: Date:

The responses are categorised as positive and negative based on the comments. The positive responses indicate that respondent feels that the project activity will lead to overall good of their own and the society.

E.2. Summary of the comments received:

All of the individual respondents are of the view that the project activity is of good to them and the society. The renewable biomass based project activity has lead to the environmental sustainability without causing any pollution. Summary of detailed response is as follows:

S. No	Question	Response	
		Yes (%)	No (%)
1	Is your environment affected by the project?	0	100
2	Is there any environmental / social problem due	0	100

	to biomass collection and transportation to project site?		
3	Does the project have any negative impact on human health or biodiversity?	0	100
4	Has the employment increased due to the project?	100	0
5	Has your livelihood negatively affected by the project?	0	100
6	What are the benefits from the project?	Below	Below
7	Any other comments and suggestions?	Below	Below

The other comments received were as follows:

(a) Further increment in job opportunities among the local skilled & unskilled labours
(b) Beneficiary for the local labours & local biomass producers as well.
(c) Very good initiative by BIDCO towards sustainable development & environment friendliness.

The stakeholders viewed BIDCO as a reputed company contributing to the local economy. Overall there was view and agreement that the proposed project is a beneficial project from sustainability view-point

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

The comments received were positive for the project activity and did not required follow up action from the project proponent. There were no specific comments that required follow up action from CDM project activity point of view.

In general there was no adverse comment on the project activity by the local stakeholders. The stakeholders have given very positive feedback and thus no measures were required to be taken. However, project proponents assured that during the operation of the project activity any concerns regarding the project activity can be brought to their notice and quick action would be taken up to any negative impacts from the project activity affecting the stakeholders. The project proponent thanked the local stakeholders for their co-operation in installation and operation of the project activity.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	BIDCO Oil Refineries Ltd.
Street/P.O.Box:	P.O. Box 239
Building:	--
City:	Thika,
State/Region:	--
Postfix/ZIP:	01000
Country:	Kenya
Telephone:	(+254) 67 282-1000
FAX:	+254-67-30103
E-Mail:	--
URL:	--
Represented by:	--

Title:	Director,
Salutation:	Mr
Last Name:	Shah
Middle Name:	--
First Name:	Vimal
Department:	--
Mobile:	--
Direct FAX:	--
Direct tel:	--
Personal E-Mail:	vimal@bidco-oil.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Public funding from Annex I countries and diversion of official development assistance (ODA), is not involved in this project activity. The project cost is met by the project proponents through own sources and in part by debt financing from banks.

Annex 3

BASELINE INFORMATION

Please refer section B.4 and B.6.1 of this document

Annex 4

MONITORING INFORMATION

The monitoring plan is developed for developing suitable data collection methods to measure & collect each parameter and maintenance of records according to the monitoring methodology of AMS – I.C., ver. 18. The monitoring plan is project specific for which the project performance with all relevant criteria will be monitored. Proper training is being provided to concerned personnel and instruments used to monitor data are also calibrated.

Overall Project Management and CDM Team:

A dedicated team responsible for the CDM project activity comprising of technical and management personnel from relevant departments will be responsible for monitoring of all the parameters mentioned in the section B.7.1. The CDM team will ensure the proper management of the CDM project activity. The team would be responsible for reviewing the data monitored & recorded, monthly report, annual report for emission reduction, the report on the operation and maintenance and timely calibration of monitoring equipment. The CDM team will prepare an annual report pertaining to the total quantity of steam and electricity generation by the project activity and hence total quantity of fossil fuel (fuel oil) that would be displaced against which the CDM benefit are to be claimed. The operation and maintenance team would be responsible for regular inspection of monitoring equipment functioning. The CDM team will be guided by CDM consultants.

1. Director - The Director will oversee all the monitoring requirements of the CDM project. He would review the half yearly and annual report pertaining to the emission reduction estimation. He will be responsible for Quality Assurance and ensure transparency in the monitoring system and data recording. The internal audit team will be headed by him.

2. Manager: The Manager will be responsible for compliance with CDM monitoring plan, reviewing monthly report prepared by the Shift In-charge (Co-generation Unit) and based on that generating half yearly and yearly report pertaining to the total fuel oil consumption based on which the emission reduction would be estimated. He will organize & conduct the training program for CDM and related activities for the staffs and also carry out internal audit pertaining to the operation, monitoring and archiving of data.

3. Shift In-charges (Co-generation Unit): The personnel will ensure proper monitoring of the data/parameters, completeness and quality assurance of data recorded by the Operators (co-generation Unit) and prepare of monthly report. The Shift In- charge of 1st shift will prepare daily report and submit to Shift In-charge.

4. Operator –Co-generation Unit: The personnel will ensure proper running of the machines in terms of routine checks on daily basis, periodical maintenance. The personnel will also be entitled for biomass consumption data, electricity generation data, steam generation data, steam temperature and pressure data recording on shift basis.

Addressing Uncertainty of Data in Monitoring:

The steam and electricity generation data monitored will be cross-checked with the biomass consumption data and invoice of biomass procurement to ensure accurate data recording. For exceptional circumstances related to the failure of the metering system, immediate replacement would be carried out

by the project proponent. Under such exceptional condition the vendor invoice would be used for the monitoring purpose.

Calibration of Measuring Equipments:

The reliability of the monitoring system depends on the accuracy of the measuring system and the quality of the relevant equipment. Thus, measuring instruments would be calibrated as per manufacturers manual or at least once a year to ensure the reliability of the system and the accuracy of the readings. Once the meters are found to be malfunctioning or registering data outside the acceptable limits of accuracy, it shall be repaired, re-calibrated or replaced as soon as possible.

Maintenance procedures:

All the monitoring instruments (fixed and portable) e.g. pressure gauge, temperature meter, steam flow meter, weighing machine etc. should be inspected on weekly basis. Equipment should be checked and maintained in accordance with manufacturer's manual. The lifetime and accuracy of the equipments will be checked during internal audit process.

Internal audit process:

The Internal Energy Audit would give a positive orientation towards energy conservation, energy cost reduction, proper storing procedure, preventive maintenance and quality control programmes which are vital for production and utility activity compliances with CDM rule and the quality plan. Such an audit programme will help to keep focus on variations which occur in energy costs, availability and reliability of supply of energy, etc. Internal audit should be undertaken on annual basis one month before each CDM verification process. Manager (Plant) will be responsible for internal audit. He will review day to day recording procedure in the project, storing procedure practiced in the project, etc and suggest corrective measures wherever is required. CDM Consultant will be involved in internal audit process and guide on CDM requirements.

Plant Energy Performance:

Plant Energy Performance (PEP) is the measure and comparison of energy consumption for manufacture of products with the past practice. This will help in taking corrective actions whenever a plant will operate in inefficient mode and achieve optimum level of specific fuel consumption. Thus it will ensure minimum or no wastage of biomass in co-generation system.

Training on Monitoring and Archiving of Data Related to Project Activity:

Training will be provided to the staff members of the plant on the procedure of recording and archiving of data. The training pertaining to the monitoring and archiving of the data is to be carried out by Manager Plant along with other members of CDM team. CDM Consultants will provide training to the monitoring team for CDM project on procedure of baseline emission calculation and emission reduction estimation. The Director shall be reported on the progress of implementation of corrective actions by the team on half yearly basis. The non-conformities if any shall be closed within the stipulated time frame and approved by the Director.
