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

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. • 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:

Biomass Gasifier for Thermal Energy generation

Version: 01

Date : 03/03/2007

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

This project is being developed by acclaim technology services with the association of two private sector companies. The following table shows the ownership, capacity and location details of these two projects

S.No	Project Developer	Capacity (MW_{th})	Location
1	TANFAC	3.3	SIPCOT industrial complex, Cuddalore District, Tamilnadu
2	TAHAFET	0.9	SIDCO industrial estate, Hosur, Krishnagiri District, Tamilnadu
	Total capacity	4.2	

TANFAC

TANFAC is a Limited company which manufacturing chemicals like Hydrofluoric acid, Aluminium Fluoride and Sulphuric acid and is located in SIPCOT industrial complex, Cuddalore District, Tamilnadu in India. The thermal energy required for this chemical manufacturing process was generated using carbon emissions intensive Furnace Oil (FO).TANFAC implemented a biomass gasifier project to replace the fossil fuel consumed for generating thermal energy. The capacity of the biomass gasifier is 3.3 $MW_{th.}$The major biomass used for this project activity is Prosopis Juliflora.This is the first high capacity biomass gasifier installed in India for thermal energy related applications.

TAHAFET

TAHAFET is private Limited company mainly dealing with heat treatment processes like tempering and hardening and is located in SIDCO industrial estate, Hosur, Krishnagiri District, Tamilnadu in India. Before the implementation of this project activity the thermal energy required for this heat treatment process was generated using carbon emissions intensive Light Diesel Oil (LDO).TAHAFET installed a

biomass gasifier project to replace the thermal energy generated by the LDO and the capacity of the biomass gasifier is 0.9 $MW_{th.}$ The major biomass used for this project activity is Prosopis Juliflora and coconut shell. This is the first biomass gasification project applied for thermal energy generation in Tamilnadu.

The following are the main purpose of this project activity:

- Contribute to the Sustainable Development through the effective utilization of biomass available in the project region for thermal energy generation, thereby enhancing additional income through rural employment opportunities in the region.

- Climate Change mitigation through the generation of eco-friendly thermal energy and reduce the dependence on fossil fuel based thermal energy generation.

The main objective of project activity is to achieve sustainable development in the rural region by enhancing four pillars of sustainable development such as:

- Social and Economic well being
- Environmental well being
- Technological well being

Social-Economic well being:

- After the implementation of this project activity, the thermal energy is generated by the biomass based gasifier. The biomass required for this project activity is collected and transported from the near by area thereby creating opportunities for the local people to find a new source of employment. This project activity created the new rural income resulting from the sale of biomass fuels.
- This project activity is a leading example for effective utilisation of biomass for thermal energy generation and implementation of this project activity will result in replication of renewable energy utilisation technology which will improve the eco-friendly approach of India.

Environmental well being :

In this project activity, the thermal energy is generated by the biomass based gasification process which replaces carbon emission intensive fossil fuels. As biomass is a CO_2 neutral fuel, combustion of biomass in this project activity does not result in net increase of CO_2 which is the major constituent in GHG emissions.

Technological well being:

- The technology used for this project activity is of indigenous type and is based on downdraft gasification as the air flow is in the downward direction. The decomposition products from the pyrolysis and drying pass through the oxidation zone. This leads to thermal cracking of the volatiles resulting in reduced tar content in the producer gas and it thus environmentally benign.
- The gasification technology can achieve the maximum thermal efficiency thereby minimising and avoiding the use of fossil fuels.

A.3. Project participants:

Name of party involved ((host) indicates a host party)	Private and/or Public entity (ies) project participants	Kindly indicate if the Party involved wishes to be considered as project participant
Government of India (Host Country)	ACCLAIM TECHNOLOGY SERVICES (ATS)	No

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

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

A.4.1.1. Host Party(ies):

India

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

Tamilnadu

A.4.1.3. City/Town/Community etc:

Project -I TANFAC

SIPCOT Industrial Complex

Cuddalore Taluka

Cuddalore District

Project -II TAHAFET

Plot No.A-17

SIDCO Industrial Estate

Hosur Taluka

Krishnagiri District

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

Project -I TANFAC:

The project is located at SIPCOT Industrial Complex in Cuddalore Taluka of Cuddalore District, Tamilnadu. The SIPCOT Industrial Complex is 6 km away from Cuddalore Taluka. The nearest Railway Station and seaport is at Cuddalore about 5 km from site. The nearest air port is at Pondicherry about 40 kms from site. The project site is located within 15º 5/11 11' to 12º 35'N latitude and 77º 09'E - 78 º 38' to 80º E longitude respectively

Project -II TAHAFET:

The project is located at SIDCO Industrial Estate in Hosur Taluka of Krishnagiri District in Tamilnadu. The SIDCO Industrial Estate is 3 km away from Hosur Railway Station. The nearest air port is at Bangalore about 60 km from site. The nearest seaport is at Chennai about 350 km from site. The project site is located within 11º 12'N to 12º 49' N latitude and 77º 27'E to 78º 38' E longitude respectively

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

The project falls under the UNFCCC small-scale CDM project activity categories under **Type-I** with project activity being Thermal energy generation for a system.

Type I : Renewable Energy project

Category : I.C Thermal energy for the user

Version: 9

Date :23 December 2006

The technology involved in this project activity is the gasification technology. The gasification is a process by which biomass is converted by a thermo-chemical process into clean gaseous form. The technology is explained below.

Gasification Technology:

Gasification is a process that converts carbonaceous materials into combustible gases. The resulting gas is called producer gas. Gasification relies on chemical processes at elevated temperatures >700 ^{O}C. The

substance of a solid fuel is usually composed of the elements carbon, hydrogen and oxygen. In the gasifiers the biomass is heated by combustion. Four different processes can be distinguished in gasification: drying, pyrolysis, oxidation and reduction

Drying:

The first stage of gasification is drying. Usually air-dried biomass contains moisture in the range of 13-15 % .The moisture content of biomass in the upper most layers is removed by evaporation using the radiation heat from oxidation zone .The temperature in this zone remains less than 120 °C.

Pyrolysis:

The process by which biomass looses all its volatiles in the presence of air and gets converted to char is called pyrolysis. At temperature above 200°C, biomass starts loosing its volatiles. Liberation of volatiles continues as the biomass travels almost until it reaches the oxidation zone. Once the temperature of the biomass reaches 400°C, a self-sustained exothermic reaction takes place in which the natural structure of the wood breaks down. The products of pyrolysis process are char, water vapour, Methanol, Acetic acid and considerable quantity of heavy hydrocarbon tars.

Oxidation:

The moisture vaporised in the drying zone and the volatiles released in the pyrolysis zone travels down towards oxidation zone. In this zone a calculated quantity of air drawn through the nozzles provided for the purpose. The pyrolysis gases, char and the water vapour all have to pass through this zone and combustion similar to normal stove /furnace takes place. A portion of the pyrolysis gases and char bums here and the temperature rises to about 900 – 1200°C. The main product of oxidation process is CO_2.

Reduction:

The products of oxidation zone then pass through the reduction zone. Reduction zone is packed with a bed of charcoal. This charcoal is initially supplied from external sources. Later it is in the continuous process of being consumed by the reduction reaction and being simultaneously replenished by the char produced in the pyrolysis zone .The temperature in this zone is maintained at 600 – 900° C.

The producer gas generated in the gasifier is passed through a main gas line then supplied to the gas burners. The ash is periodically drawn from the bottom of the reactor by means of a screw extractor.

The main auxiliary equipment for the gasification plant consist of a i) gas cooling system, ii) gas cleaning systems

i. The gas cooling system consists of a two coolers having swirl sprayer arrangement for cooling the gas by direct impingent. The producer gas leaving from gasifier is at a temperature of 550-750^{o} K which is reduced to ambient temperature by this cooling system.

ii. The gas filtering system consist of sand bed filters to reduce the quantity of tar and particulate matter in the gas to levels that are acceptable for direct admission into the burner.

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

Years	Annual estimation of emission reduction in tons of CO_2
2007	4,536
2008	7,737
2009	7,737
2010	7,737
2011	7,737
2012	7,737
2013	7,737
Total estimated reductions (tons of CO_2)	50,958
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tons of CO_2)	**7,279**

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

There is no public funding for this project activity.

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

The proposed project activity is a small-scale project activity and it is not a debundled component of a larger project activity:

SECTION B. Application of a baseline and monitoring methodology

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

The methodology applied for this project activity is

Type : I.Renewable Energy Projects

Category : I.C.Thermal Energy for the user

Version : 09

Date : 23 December 2006

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

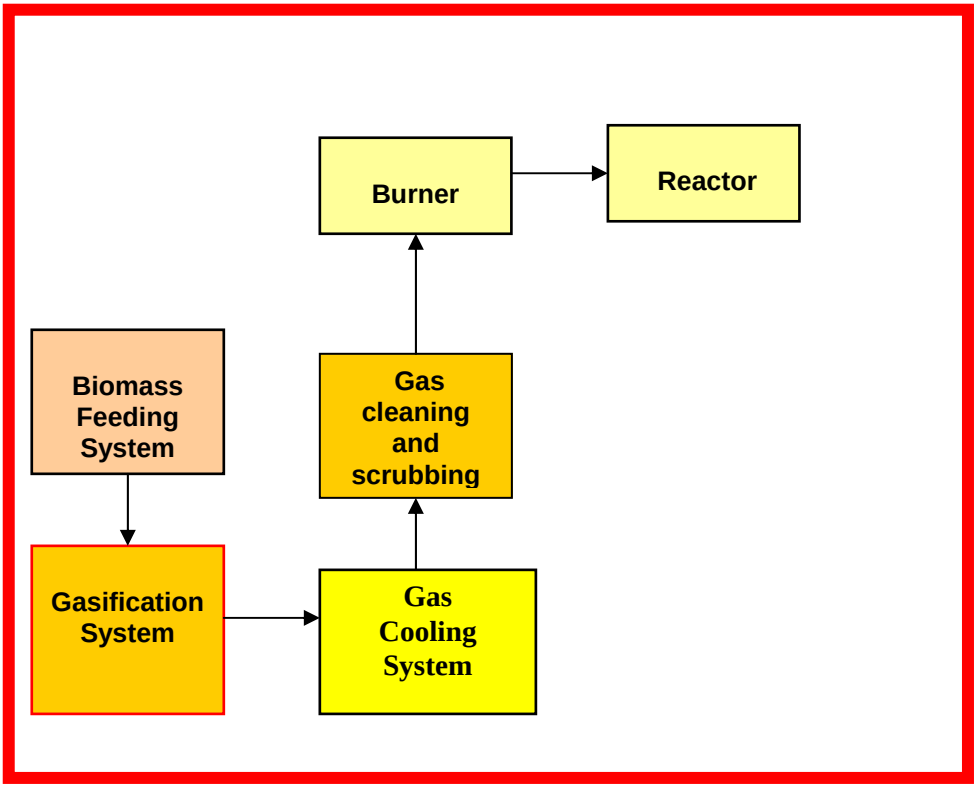
The justification of the choice of the project category is explained below:

As per the Methodology	As per the Project Activity
This category comprises renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuels. Examples include solar thermal water heaters and dryers, solar cookers, energy derived from renewable biomass for water heating, space heating, or drying, and other technologies that provide thermal energy that displaces fossil fuel. Biomass-based cogenerating systems that produce heat and electricity for use on-site are included in this category	This is a biomass based gasification project used for thermal energy generation which replaces fossil fuel like FO and LDO, hence the methodology is applicable for this project activity.
Generation capacity is specified by the manufacturer, it shall be less than 15MW.	-
For co-generation systems and/or co-fired systems to qualify under this category, the energy output shall not exceed 45 $MW_{thermal}$. E.g., for a biomass based co-generating system the capacity for all the boilers affected by the project activity combined shall not exceed 45 $MW_{thermal}$. In the case of the cofired system the installed capacity (specified for fossil fuel use) for each boiler affected by the project activity combined shall not exceed 45 $MW_{thermal}$.	The total capacity of the project activity is 4.2 $MW_{thermal}$ it is less than 45 $MW_{thermal}$, hence the methodology is applicable for this project activity.

In the case of project activities that involve the addition of renewable energy units at an existing renewable energy facility, the added capacity of the units added by the project should be lower than 45 MW thermal and should be physically distinct from the existing units.	This is a new biomass gasification project, which generates thermal energy and replaces the existing fossil fuel oil system.

B.3.Description of the project boundary:

The flow chart of the project and its boundaries is shown in the figure below. The project boundary encompasses the physical, geographical site of the gasification plant.



B.4. Description of baseline and its development:

As per the paragraph no. 6 of methodology AMS.I.C *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 coefficient for the fossil fuel displaced. IPCC default values for emission coefficients may be used.*

This project activity is a biomass based gasification project used for thermal energy generation which replaces fossil fuels used for thermal energy generation before the implementation of this project activity. Hence the baseline for this project activity is generation of thermal energy by fossil fuels. Baseline emission is calculated based on the fossil fuels replacement by biomass. IPCC default emission coefficients value for fossil fuels is used for baseline emission calculation. The fossil fuels Consumption in the absence of this project activity is calculated by amount of biomass consumed by the gasifier.The baseline emission for this project activity is explained detail in the Annex-3.

Date of completing the final draft of this baseline section *(DD/MM/YYYY)*: 28/02/2007

The baseline calculations have been done by:

Asia Carbon Emission Management India P Ltd.,
167, Kodambakkam High Road,
Nungambakkam, Chennai,
Tamilnadu - 600 024.

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:

Among the barriers suggested in the Attachment A to Appendix B of the simplified modalities and procedures for Small Scale CDM project activities, the following barriers have been identified for this biomass thermal gasification project.

a. Technological barrier
b. Barrier due to prevailing practice
c. Other barriers

a. Technological barrier

A less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions.

The Project Activity I and Project Activity II are located in industrial complexes of Cuddalore and Hosur Taluka respectively . Before implementation of this project activity, carbon emissions intensive FO and LDO have been utilized by TANFAC and TAHAFET for thermal energy generation.Inorder to reduce the GHG emissions from FO and LDO combustion, the project promoters installed a new biomass gasification technology for their thermal application. The less technologically advanced alternative to the project activity is continuation of the baseline scenario i.e utilization of FO and LDO for thermal energy generation, involving lower risk compared with the new biomass gasification technology.The biomass based thermal energy gasifiers carries more risks than the conventional FO and LDO based thermal energy system. The various risks involved in this project activity are listed below:

Fuel Risk:

- Escalation in the price of biomass has always been historically high due to the perception of the farmers on its demand. Erratic increase in the price of biomass is highly prevalent, even in case of pre-signed contracts with biomass suppliers for a fixed price over a period of time. The project has already witnessed hike in the price of biomass by over 25 to 35 % since its inception. One of the other reasons for an increase in the biomass price is also attributed to the expected increase in price of biomass transportation cost due to increase in the cost of diesel.

Technological Risk:

- The technology used in this project activity is down draft gasification. The biomass used for the project activity is prosopis juliflora and coconut shell. The major risk for this technology is tar formation due to the pyrolysis of biomass. The increase in moisture content of the biomass would increase the tar formation. If the moisture is less than 15 % the tar content will be in the range of 50-250 mg/Nm^3 and the increase in moisture level will increase the tar content to 700 mg/Nm^3.Hence the moisture content of the biomass has to be maintained in the desired range which is difficult. Tar formation will affect the overall performance of the gasifier as well. Compared to up draft gasification the tar formation level is very low in down draft gasifier, but requires fine cooling and cleaning system to reduce the quantity of tar and particulate matter.
- There is always a constriction at the level of the oxidation zone to force the pyrolysis products through a concentrated high temperature zone to achieve complete decomposition. This concentrated oxidation zone can cause sintering or slagging of ash resulting in clinker formation and consequent blocking of the constricted area and /or channel formation. Continuous rotating ash grates or other mechanical shaking may be required to avoid this problem.

b Barrier due to prevailing practice

Biomass gasification technology is a new technology in India.TANFAC and TAHAFET using biomass gasification technology for their thermal energy generation. The capacity of the TANFAC gasifier is 3.3 MW_{the} which is the first single higher capacity gasifier in India. The capacity of the TAHAFET gasifier is 0.9MW_{the} which is the first thermal gasifier in Tamilnadu for industrial application. These projects are located in SIPCOT, Cuddalore and SIDCO in Hosur. The prevailing practice is utilization of carbon emissions intensive FO and LDO as major fuels for thermal energy generation in these Industrial complexes. .

c. Other Barriers

The fossil fuel based thermal energy generation system is replaced by new biomass gasification Technology. Due to the replacement, the Industries faced the following barriers :

- The operating Personnel in these industries are already experienced in the conventional FO and LDO system for several years. Thus implementation of new technology requires **additional training** for the operators in the biomass gasification process.
- Operating the biomass gasification system is very difficult than conventional fossil fuel system and requires **additional manpower** for biomass transportation and handling and ensuring consistent feeding the right quality and quantity of biomass for gasification.
- The gasifier operates under negative pressure and the **feeding of biomass** to the closed system is very difficult.
- The producer gas generated in the gasifier having high inflammability range, and hence any leakage will lead to **higher operational risk**.

Conclusions

Thus the barrier analysis as carried out above clearly indicates that in the absence of the CDM project activity the baseline scenario would have been continuation of utilization of GHG intensive FO and LDO based thermal energy generation. Further the CDM revenues are critical since such revenues will be used to mitigate various risks as mentioned above.

B.6. Emission reductions:

B.6.1.Explanation of methodological choices:

This project activity is a renewable energy technology and in the absence of this project activity the thermal energy is produced by the fossil fuel. Hence the baseline emission is calculated based on the emission coefficient of the FO and LDO used in the absence of this project activity. The FO Consumption in the absence of this project activity is calculated by amount of biomass consumed by the gasifier. The biomass to FO and LDO conversion factor is used for this calculation. IPCC default emission coefficients value for FO and LDO was used for baseline emission calculation.

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

Data and parameters available at validation for TANFAC:

Data / Parameter:	$Q1_{Biomass}$
Data unit:	MT/year
Description:	Quantity of biomass consumed by the gasifier in TANFAC.
Source of data used:	Weigh bridge Receipt
Value applied:	7,709
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is cross checked with biomass log sheet.
Any comment:	-

Data / Parameter:	$C.F_{Furnace\ Oil}$
Data unit:	kg of biomass / litre of furnace oil
Description:	Biomass to furnace oil conversion factor
Source of data used:	The value is taken from the Evaluation report prepared by Anna University.
Value applied:	3.52
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value is cross checked with the existing furnace oil consumption and current biomass consumption monthly report of TANFAC.
Any comment:	-

Data / Parameter:	$C.V_{Furnace\ Oil}$
Data unit:	Tj/Ton
Description:	Calorific value of furnace oil
Source of data used:	IPCC default values are used
Value applied:	0.04019

Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	$EF_{furnace\ oil}$
Data unit:	TCO_2/Tj
Description:	Emission factor for furnace oil.
Source of data used:	IPCC default values are used
Value applied:	77.22
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data and parameters available at validation for TAHAFET:

Data / Parameter:	$Q2_{Biomass}$
Data unit:	MT/year
Description:	Quantity of biomass consumed by the gasifier in TAHAFET.
Source of data used:	Weigh bridge Receipt
Value applied:	2,102
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is cross checked with biomass log sheet.
Any comment:	-

Data / Parameter:	$C.F_{LDO}$
Data unit:	kg of biomass / litre of LDO
Description:	Biomass to LDO conversion factor
Source of data used:	The value is taken from the Joint commissioning report of TAHAFET
Value applied:	3.50
Justification of the choice of data or	The value is cross checked with the existing furnace oil consumption and current biomass consumption monthly report of TAHAFET.

description of measurement methods and procedures actually applied :	
Any comment:	-

Data / Parameter:	$C.V_{LDO}$
Data unit:	Tj/Ton
Description:	Calorific value of LDO
Source of data used:	IPCC default values are used
Value applied:	0.04333
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

B.6.3 Ex-ante calculation of emission reductions:

- **Emission Reduction by TANFAC (ER_1):**

The formula for emission reduction is

$ER_1 = BE_{furnace\ oil} – PE_1 – L_1$ …… (i)

Where,

ER_1 - Emission Reduction by TANFAC in tCO2/year

$BE_{furnace\ oil}$ - Baseline Emission due to displacement of Furnace oil in tCO2/year

PE_1 - Project emissions in tCO2/year

L_1 - Emissions due to leakage in tCO2/year

Project emissions (*PE_1)Calculation:*

This is the biomass based gasifier system. So Biomass is the main fuel used for this project activity. Other than biomass there is no fossil fuel consumption by this project activity. Combustion of biomass in the proposed project does not result in net increase in GHG emissions of CO2, CH4 and NOx. While the CO2 forms the major constituent of GHG emissions with about 98%, CH4 and NOx constitute the remaining 2%. This can well be evidenced from the typical ultimate analysis of biomass materials, which indicates

the Nitrogen content within 1 to 2%, which is negligible. Hence the CO_2 is considered as the only GHG emissions from the biomass combustion.There is no GHG emission within the project boundary.

Hence,

PE_1 = 0 …… (ii)

Emissions due to leakage (L_1):

As per paragraph 10 of the methodology AMSI-C *"If the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered"*.

The project activity is new biomass gasifier system and it is not transferred from another activity. The existing equipment is also not transferred to another activity, hence the leakage is not considered for this project activity.

Leakage due to project (L_1) = 0…… (iii)

Baseline Emission due to displacement of Furnace Oil ($BE_{furnace\ oil,}$):

Baseline Emission is calculated by multiplying the quantity of furnace oil replaced by this project activity ($Q_{furnace\ oil}$) with the CO_2 baseline emission factor for the furnace oil displaced due to the project ($EF_{furnace\ oil}$) as follows:

$B.E_{furnace\ oil}$ = $Q_{furnace\ oil}$*$C.V_{furnace\ oil}$*$EF_{furnace\ oil}$ ……(iv)

$Q_{furnace\ oil}$ = Quantity of furnace oil replaced by this project activity (tons/year)

$C.V_{furnace\ oil}$ = Calorific value of furnace oil (0.04019 Tj/Ton of F.O)

$EF_{furnace\ oil}$ = Emission factor for the furnace oil (77.22 TCO_2/Tj)

Quantity of furnace oil replaced by this project activity ($Q_{furnace\ oil}$):

$Q_{furnace\ Oil}$ = $Q_{Biomass}$/ $C.F_{Furnace\ Oil}$

$Q_{\ Furnace\ Oil}$ = Quantity of Furnace oil replaced by this project activity in (tons/year)

$Q1_{Biomass}$ = Quantity of Biomass consumed by the gasifier in TANFAC MT per year-7,709 Tons/year

$C.F_{Furnace\ Oil}$ = Biomass to furnace oil conversion factor (3.52 kg of biomass = 1 kg of furnace oil)

$Q_{Furnace\ Oil}$ = (7,709/3.52) × 0.9

= 1,971 Tons/ year

Put $Q_{Furnace\ Oil}$ in formulae (iv)

Where:

$BE_{furnace\ oil}$ = 1,971 × 0.04019 × 77.22

= 6,117 Ton of CO_2/year

By applying values for $BE_{furnace\ oil}$, PE_1, L_1 in formula (i)

ER_1 = $BE_{furnace\ oil} – PE_1 – L_1$

= 6,117-0-0

= 6,117 tCO2/year

Net Emission Reduction by the project activity of TANFAC (ER_1) = 6,117 tCO2/year

- **<u>Emission Reduction by TAHAFET (ER_2)</u>**

The formula for net emission reduction is :

$ER_2 = BE_{LDO} – PE_2 – L_2$ …… (v)

Where,

ER_2 - Emission Reduction by TANFAC tCO2/year

BE_{LDO} - Baseline Emission due to displacement of LDO in tCO2/year

PE_2 - Project emissions in tCO2/year

L_2 - Emissions due to leakage in tCO2/year

<u>Project emissions (*PE_2*)*Calculation:*</u>

This is the biomass based gasifier system. So Biomass is the main fuel used for this project activity. Other than biomass there is no fossil fuel consumption by this project activity. Combustion of biomass in the proposed project does not result in net increase in GHG emissions of CO2, CH4 and NOx. While the CO2 forms the major constituent of GHG emissions with about 98%, CH4 and NOx constitute the remaining 2%. This can well be evidenced from the typical ultimate analysis of biomass materials, which indicates the Nitrogen content within 1 to 2%, which is negligible. Hence the CO_2 is considered as the only GHG emissions from the biomass combustion.There is no GHG emission within the project boundary.

Hence,

$PE_2 = 0$ …… (vi)

Emissions due to leakage (L_2):

As per paragraph 10 of the methodology AMSI-C *"If the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered"*.

The project activity is new biomass gasifier system and it is not transferred from another activity. The existing equipment is also not transferred to another activity, hence the leakage is not considered for this project activity.

Leakage due to project (L_2) = 0…… (vii)

Baseline Emission due to displacement of LDO ($BE_{LDO,}$):

Baseline Emission is calculated by multiplying the quantity of LDO replaced by this project activity (Q_{LDO}) with the CO_2 baseline emission factor for the LDO displaced due to the project (EF_{LDO}) as follows:

$BE_{LDO} = Q_{LDO} * C.V_{LDO} * EF_{LDO}$ ……(viii)

Q_{LDO} = Quantity of LDO replaced by this project activity in (tons/year)

$C.V_{LDO}$ = Calorific value of LDO (0.04333 Tj/Ton of LDO)

EF_{LDO} = Emission factor for the LDO (73.2 TCO_2/Tj)

CDM – Executive Board

Quantity of LDO replaced by this project activity (Q_{LDO}):

$Q_{LDO} = Q_{Biomass} / C.F_{LDO}$

Q_{LDO} = Quantity of LDO replaced by this project activity in MT per year

$Q2_{Biomass}$ = Quantity of Biomass consumed by the gasifier in TAHAFET MT per year-2,102

$C.F_{LDO}$ = Biomass to LDO conversion factor (3.50 kg of biomass = 1 kg of LDO)

Q_{LDO} = (2102/3.50)×0.85

= 511 Tons/year

Apply value of Q_{LDO} in formulae (viii)

Where:

BE_{LDO} = 511×0.04333×73.2

= 1,620 Ton of CO_2/year

Put BE_{LDO}, PE_2, L_2 in formula (v)

ER_2 = $BE_{LDO} – PE_2 – L_2$

= 1,620-0-0

= 1,620 tCO2/year

Emission Reduction by TAHAFET (ER_2) = 1,620 tCO2/year

Total Net Emission Reduction (ER) = $ER_1 + ER_2$

= 6,117 + 1,620

= ***7,737 tCO2/year***

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

S.No	Year	Base line Emission tCO_2/year			Total Project emission tCO_2 /year	Net Emission reduction tCO_2/year
		TANFAC	TAHAFET	Total		
1	2007	3,587	949	4,536	0	4,536
2	2008	6,117	1,620	7,737	0	7,737

3	2009	6,117	1,620	7,737	0	7,737
4	2010	6,117	1,620	7,737	0	7,737
5	2011	6,117	1,620	7,737	0	7,737
6	2012	6,117	1,620	7,737	0	7,737
7	2013	6,117	1,620	7,737	0	7,737
Total		40,289	10,669	50,958	0	50,958

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

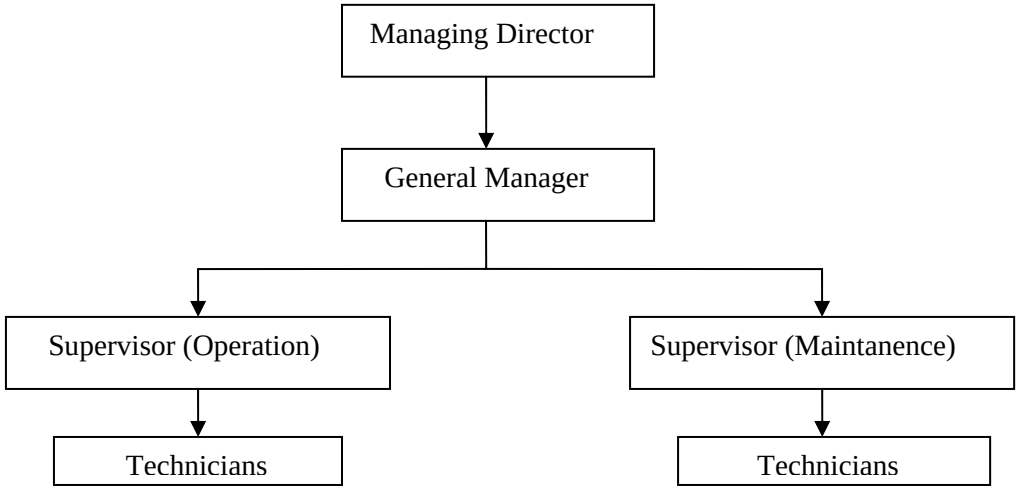
B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	$Q1_{biomass}$
Data unit:	*MT/year*
Description:	Quantity of biomass consumed by the gasifier in TANFAC.
Source of data to be used:	Weigh bridge Receipt
Value of data	7,709
Description of measurement methods and procedures to be applied:	Calculated from weigh bridge receipt
QA/QC procedures to be applied:	The data is cross checked with biomass log sheet.
Any comment:	-

Data / Parameter:	$Q2_{biomass}$
Data unit:	*MT/year*
Description:	Quantity of biomass consumed by the gasifier in TAHAFET.
Source of data to be used:	Weigh bridge Receipt
Value of data	2,102
Description of measurement methods and procedures to be applied:	Calculated from weigh bridge receipt
QA/QC procedures to be applied:	The data is cross checked with biomass log sheet.
Any comment:	-

B.7.2 Description of the monitoring plan:



To address all O&M issues, though the overall authority and responsibility belongs the management, it has formed a team of Technician and Supervisors headed by a General Manager to effectively control and monitor the complete process of fuel procurement, quality issues, and the handling and storage of material in the plant area.

S.No	Monitoring Equipment	Functions	Calibration of the Equipments	Quality of Data
1.	Weighbridge	Measurement of biomass quantity	Calibration is done at regular intervals as per the supplier schedule.	The biomass quantity is cross checked with the invoice from the supplier and the entry record.

All the measurements taken by the Technician are recorded in the log sheets and these log sheets are verified by the supervisor. Every shift data log sheet is submitted to the General Manager and these log sheets are cross verified. The General Manager maintains all the records in electronic and paper mode. The General Manager submits a weekly report to the management, which will be documented and stored in the project office. By this operational structure, the management can monitor the project activity and make amendments immediately, if needed. Hence there is no chance for data loss.

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

Date of Completion of the base line study: 28/02/2007

Asia Carbon Emission Management India P Ltd.,
167, Kodambakkam High Road,
Nungambakkam, Chennai,
Tamilnadu - 600 034.

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:

15/04/2001

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

The operational life time of the project is 25 years

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

C.2.1. Renewable crediting period

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

01/06/2007

C.2.1.2. Length of the first crediting period:

7 Years

C.2.2. Fixed crediting period:

N/A

C.2.2.1. Starting date:

N/A

C.2.2.2. Length:

N/A

SECTION D. Environmental impacts

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

According to Indian regulation, the implementation of small scale biomass plants does not require an Environmental Impact Assessment (EIA).This project activity is an environment friendly project. The project activity generates producer gas from biomass which is a clean source of energy. The producer gas is used for thermal energy generation and thus will replace the CO_2 intensive FO and LDO. The process is thus highly environment friendly as it replaces fossil fuel with renewable energy alternative. The ash generated in this process is very low(less than 4%) and it is non- toxic. The net CO_2 emission from this project activity is zero.

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:

This project activity is a small scale project activity. There is no significant environmental impact due to this project activity and hence environmental impacts assessment is not required for this project activity.

SECTION E. Stakeholders' comments

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

The technology provider for this project activity is IISc, Bangalore. TANFAC and TAHAFET conducted stakeholders meeting at their project site with local people near to this project activity in order to receive local stakeholders support and to compile their comments about the installed biomass gasification project for their thermal energy generation. The project promoter explained the stakeholders about the various benefits like eco-friendly nature, increase of income due to the supply of biomass and employment opportunities of this biomass gasification project. The local people also agreed that the biomass gasification system is a eco friendly project compared to the fossil fuel system operated earlier. The project proponent has already established good relationship with local people who ensure co-operation for the successful and continuous operation of the plant. There is no negative comment received from the stakeholders.

E.2. Summary of the comments received:

The following Statutory bodies have examined and studied about all the aspects of the project and have issued necessary clearances to establish the project:

- Tamil Nadu Energy Development Agency (TEDA), the promotion and policy implementation body in respect of renewable energy projects in Tamil Nadu has issued its sanction letter to the project. Proc.No.2224/BE/TEDA/ 2000/I
- Joint commissioning report issued for this project by Indian Institute of Science, Bangalore (IISc) and Tamil Nadu Energy Development Agency (TEDA) on 22/09/2001.

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

There is no negative comment received from the stakeholders.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Project Entity

Organization:	Acclaim Technology Services
Street/P.O.Box:	6/1 Sriraman Enclave, Third Main Road,
Building:	Raja Annamalai Puram,
City:	Chennai
State/Region:	Tamil Nadu
Postfix/ZIP:	600 028
Country:	India
Telephone:	91-44-5216 9190
FAX:	91-44-5203 0967
E-Mail:	acclaim_tech@rediffmail.com
URL:	
Represented by:	
Title:	Advisor
Salutation:	Mr.
Last Name:	
Middle Name:	
First Name:	V.Chandramohan
Department:	
Mobile:	+91 94440 19321
Direct Fax:	91-44-5203 0967
Direct Tel:	91-44-5216 9190
Personal E-Mail:	acclaim_tech@rediffmail.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding involved in this project activity.

Annex 3

BASELINE INFORMATION

Baseline Information for TANFAC:
Biomass Conversion Factor:

S.No	Project details	Basis Production	Fuel Consumption	
			Furnace Oil	Biomass
1	Before the project activity	1 ton of HF	140 litres of Furnace oil	-
2	After the project activity	1 ton of HF	15.15 litres of Furnace oil	440 kg of biomass

Source: Gasification Evaluation report for TANFAC prepared by Anna University, Chennai.

- 1 ton of Hydro Fluoric acid production requires 140 litres of Furnace oil before the project activity. (140 lts F.O/Ton of H.F)
- After the implementation this project activity 1 ton of Hydro Fluoric acid production requires440 kg of biomass and 15.15 litres of Furnace oil.

The furnace oil replacement by 440 kg of biomass = (140 -15.15) litres of Furnace oil

440 kg of biomass = 124.85 litres of Furnace oil

1 lit furnace oil = 440/124.85 kg of biomass

= **3.52 kg of biomass/** lit F.O

Furnace oil Replacement:

Total quantity of biomass consumed by this project activity = 7709 Tons/year

Total quantity of furnace oil replaced by this project activity = (7709 /3.52)*0.9 lit F.O

= 1971 tons F.O/year

Baseline Emission:

Quantity of furnace oil replaced = 1971tons F.O/year

Emission Factor for furnace oil = 77.22 TCO_2/Tj

Calorific value of furnace oil = 0.04019 Tj/Ton of F.O

Baseline emission = 1971 *77.22 *0.04019

= **6117 Tons of CO_2 /year**

Baseline Information for TAHAFET:
Biomass Conversion Factor:

S.No	Project details	Operation Period	Fuel Consumption	
			LDO	**Biomass**
1	Before the project activity	1,555 Hr	97,137 Lt	-
2	After the project activity	1,555 Hr	-	3,39,980 Kg

Source: Joint Commissioning Report prepared by Indian Institute of Scienc, Bangalore

3,39,980 kg of biomass	=	97,137 litres of LDO
1 lit LDO	=	339980/97137 kg of biomass
	=	**3.50 kg of biomass/** lit LDO

LDO Replacement:

Total quantity of biomass consumed by this project activity	=	2102 Tons/year
Total quantity of LDO replaced by this project activity	=	(2102 /3.50)*0.85 lit LDO
	=	511 tons of LDO/year

Baseline Emission:

Quantity of LDO replaced	=	511 tons of LDO/year
Emission Factor for LDO	=	73.2 TCO_2/Tj
Calorific value of LDO	=	0.04333 Tj/Ton of LDO
Baseline emission	=	511*73.2 *0.04333
	=	**1,620Tons of CO_2 /year**

Annex 4

MONITORING INFORMATION

Monitoring plan already discussed in section B.7.

Appendix 1

Abbreviations

CDM	Clean Development Mechanism
CER	Certified Emission Reductions
F.O	Furnace Oil
LDO	Light Diesel Oil
SIPCOT	Small Industries Promotion Corporation of Tamilnadu.
SIDCO	Small Industries Development Corporation.
CO_2	Carbon Di oxide
DPR	Detailed Project Report
GHG	Green House Gas
IPCC	Intra governmental Panel for Climate Change
KP	Kyoto Protocol
MNES	Ministry of Non-Conventional Energy Sources
MW	Megawatt
NGO	Non Government Organizations
PDD	Project Design Document
QA	Quality Assurance
QC	Quality Control
TEDA	Tamilnadu Energy Development Agency

Appendix 2
References

1	Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC)
2	Website of United Nations Framework Convention on Climate Change, **http://unfccc.int**
3	UNFCCC decision 17/CP.7: Modalities and procedures for a clean development mechanism as defined in article 12 of the Kyoto Protocol
4	UNFCCC, Clean Development Mechanism, Project Design Document (CDM-PDD) AMS1C
5	Detailed Project Report(DPR) – TANFAC and TAHAFET
6	Monthly Biomass Consumption Report of TANFAC and TAHAFET
7	Website of Ministry of Environment and Forest (Government of India) **http://envfor.nic.in/divisions/iass/notif/eia.htm**
8	Website of Ministry Non-Conventional Energy Sources (MNES), Government of India, **www.mnes.nic.in**