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:

Biomass based steam generation project by Sterling Agro Industries Ltd.
Version: 1.3
Date: 31/08/09

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

Sterling Agro Industries Ltd. (Sterling) has undertaken a project activity, which entails thermal energy generation using renewable fuels. The project activity is being implemented at Dairy products manufacturing unit at Bhitouna, Kasganj-Soron Road, Dist-Kanshiram Nagar, Uttar Pradesh. The project activity involves the installation of biomass based boiler with an installed capacity of 15 TPH avoiding use of coal in steam generation. The main fuel (biomass) used is rice husk along with other agriculture residues as available in the region.

In the absence of this project activity, equivalent amount of energy would have been generated from coal based boiler which would spew the comparable amount of GHG into the atmosphere. Hence, the implementation of this project activity leads to reduction in GHG emissions associated with the coal based steam generation.

Project activity's contribution to sustainable development:
The project activity contributes to the sustainable development in the following manner:

Social well being:

- The project activity will result in lower GHG emissions to the surrounding environment and improve the working conditions inside the plant premises as well as improving the local environment for people living in close proximity.
- The project activity will provide business opportunity for biomass suppliers, contractors, local people etc.

Environmental well being:

- Renewable biomass is used as a fuel in the project activity. Uses of renewable fuels will reduce the GHG emission to the environment as compared to non-renewable fuels which have positive emissions to the atmosphere.
- The project activity will also reduce the pollution associated with the extraction and transport of the fossil fuel.

Economic well being:

- The project activity will create employment opportunities during the project stage and operation and maintenance of the boiler.
- The project activity will help in conservation of fast depleting natural resources like coal, thereby contributing to the economic well being of country as a whole.

Technological well being:

- The project activity is expected to increase awareness and interest among the industry players to make investments in similar areas.
- The project activity is also expected to encourage technology providers in putting more R&D efforts towards new and renewable technology development.

A.3. Project participants:

Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India	Private entity: Sterling Agro Industries Ltd.	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):

Country: India

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

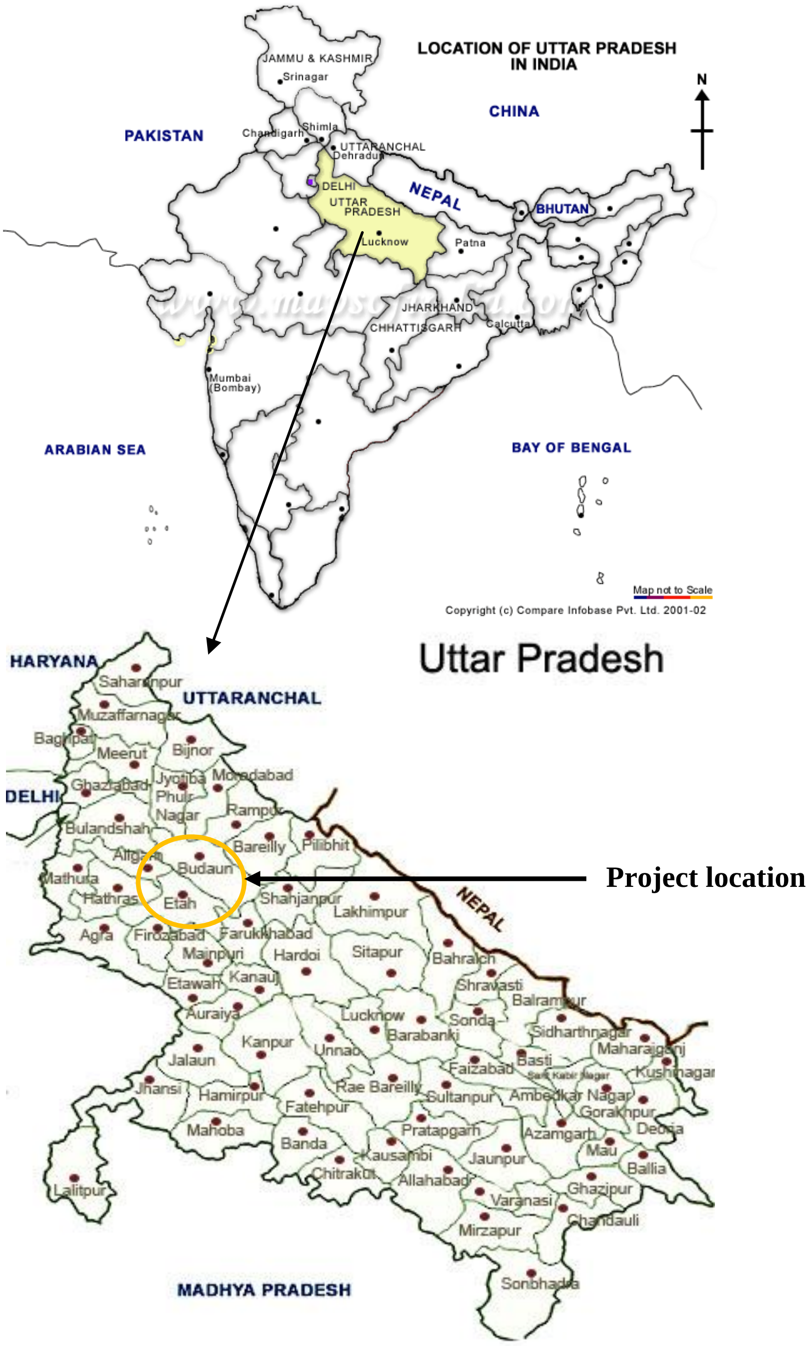
State: Uttar Pradesh

A.4.1.3. City/Town/Community etc:

Village: Bhitouna
Dist: Kanshiram Nagar
State: Uttar Pradesh

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

Kasganj is connected to the project site by state highway. Kasganj Bus Station is the nearest bus terminal. Agra Civil Enclaves is the nearest airport. The geographical location of the plant is between Longitude $78^0$42’00’’ East and Latitude $27^0$48’00’’ North. Location is depicted in following maps-



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

The project activity is a small scale project activity and confirms to Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

TYPE I: Renewable Energy Projects,

Category **IC: "Thermal energy for the user with or without electricity";** Version 13, Sectoral Scope 01, EB-38 (dated 28th March 2008)

Reference:
http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_YL0327DQSKVFXYQREWRT3VNR58402G

Technology employed:
The project activity entails installation of biomass boiler for thermal energy generation. In the project activity the project proponent will use renewable biomass (mainly rice husk along with other agriculture residues) in the boiler for steam generation.

Technical specification of the boiler used in the project activity is as below –

Type	Semi outdoor, Bi drum, water tube, AFBC boiler	
Capacity	15	TPH
Steam Pressure	21	kg/cm2
Steam Temperature	Saturated	
Make	Cheema Boiler	

The technology is environmentally safe and sound.

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

Years	Estimation of annual emission reductions in tonnes of CO_2 e
2009-2010	18289
2010-2011	18289
2011-2012	18289
2012-2013	18289
2013-2014	18289
2014-2015	18289
2015-2016	18289
2016-2017	18289
2017-2018	18289
2019-2020	18289
Total estimated reduction (tonnes of CO_2 e)	182890
Total number of crediting years	10
Annual average of the estimated reductions over the crediting period	18289

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

The project activity does not involve any public funding from Annex-1 countries or through ODA

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

The project activity is not a de-bundled component of a large project activity as there is no registered small scale project activity or application to register another project activity;

- with the same project participants
- in the same category and technology/measure; and
- whose project boundary is within 1 km of project boundary of the small scale project activity.

None of the above is applicable to the present project activity. Therefore, the project activity is not a debundled component of a large scale project activity. This is first such project from project proponent proposed under CDM.

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:

Methodology:
Type I: Renewable Energy Projects
Category **IC: "Thermal energy for the user with or without electricity"**
Version 13
Sectoral Scope 01
EB-38
Dated 28th March 2008

Reference:
The list of the small-scale CDM project activity categories contained in Appendix B of the simplified M&P for small-scale CDM project activities[1].

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

The position of the CDM project activity vis-à-vis applicability conditions in the AMS-I.C is described in the following table. This methodology comprises renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuels under the following conditions:

Applicability Conditions	Position of the project activity vis-à-vis applicability conditions

[1] http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_YL0327DQSKVFXYQREWRT3VNR58402G

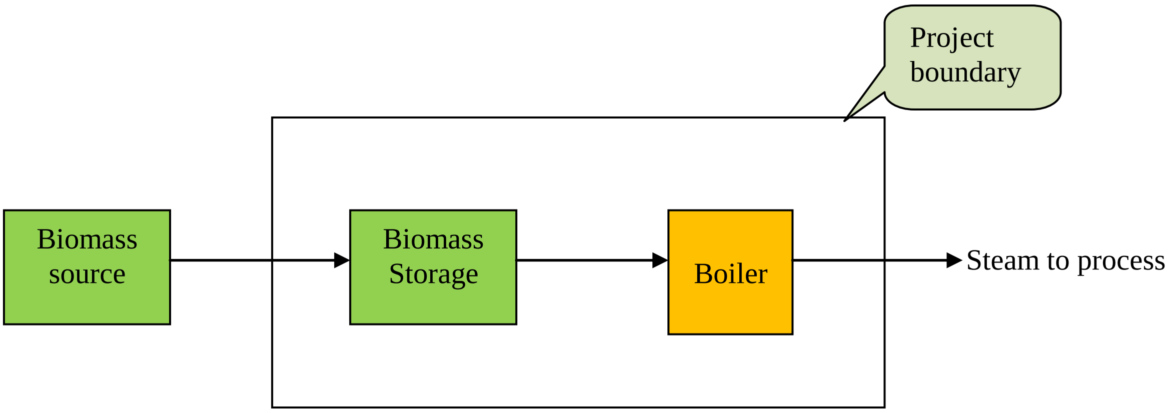
This category comprises renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuels. Examples include solar thermal water heaters and dryers, solar cookers, energy derived from renewable biomass for water heating, space heating, or drying, and other technologies that provide thermal energy that displaces fossil fuel. Biomass based co-generating systems that produce heat and electricity are included in this category.	The project activity involves the installation of renewable biomass based boiler that produces steam for use in spray dryer and milk processing.
Where thermal generation capacity is specified by the manufacturer, it shall be less than 45 MW.	The thermal generation capacity of the project activity is only 9.83 MWthermal (refer annex-3).
For co-fired systems the aggregate installed capacity (specified for fossil fuel use) of all systems affected by the project activity shall not exceed 45 MWth. Cogeneration projects that displace/ avoid fossil fuel consumption in the production of thermal energy (e.g. steam or process heat) and/or electricity shall use this methodology. The capacity of the project in this case shall be the thermal energy production capacity i.e., 45 MWth.	The thermal generation capacity of the project activity is only 9.83 MWthermal (refer annex-3).
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 be lower than 45MWth and should be physically distinct from the existing units.	The project activity is not the extension of an existing renewable energy facility.

As demonstrated above the project activity satisfies the qualifying criteria of Type I: Renewable Energy Projects and Category **IC: "Thermal energy for the user with or without electricity"**. Hence the choice of project Type and category is justified.

B.3. Description of the project boundary:

"The physical, geographical site of the renewable energy generation delineates the project boundary". This project boundary includes the steam generating boiler and fuel storage area.

Project boundary is illustrated in the following diagram:



B.4. Description of baseline and its development:

As per para 6 of the small scale methodology AMS I. C version 13, '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.'

The project proponent had following alternatives in order to generate steam:

1. Use of fossil fuels like coal, furnace oil and diesel as fuel source
2. Use of biomass (rice husk) as fuel source

The decision of fossil fuel that would have been used in the absence of project activity will be based on the costs of various fuels options, *i.e.* fuel cost per unit of energy supplied.

The unit cost of various fuels options available for steam generation per unit of energy generation, are shown below.

Fuel type	Fuel NCV	Fuel price	Cost per unit of energy
FO	0.0000404 TJ/Kg[2]	33 Rs./Kg[3]	816831.683 Rs./TJ
Diesel	0.000043 TJ/Kg[4]	34.86 Rs./lt[5]	988655.701 Rs./TJ
Coal	1.8828E-05 TJ/Kg[6]	4 Rs./Kg[7]	212449.543 Rs./TJ

[2] IPCC default value

[3] http://www.bharatpetroleum.com/sbu/ind_comm/gen_petroprices.asp?from=ind

[4] IPCC default value

[5] http://www.iocl.com/products/HighSpeedDiesel.aspx

[6] Plant Lab data

As is evident from above, coal has the lowest unit cost amongst all the fuel options available (It is substantially low). Besides this, prior to the project activity project proponent has been using coal as fuel to meet its steam requirements. Therefore coal has been chosen as the possible fuel alternatives for the project activity.

Therefore coal and biomass (without CDM benefits) have been chosen as the possible fuel alternatives for the project activity.

Now the project proponent had following alternatives in order to generate steam:

Alternative-1: Steam generation using coal
This alternative considers onsite generation of steam in a coal fired boiler.

Alternative-2: Steam generation using Biomass without CDM benefit
The decision of the plausible baseline for this project activity is based on the cost of unit energy generation. The least levelized cost of unit energy generation will be taken as baseline option for the project activity. The detailed explanation for the basis of unit cost analysis is given in section B.5. The summary of the unit cost analysis has been discussed in the table below.

Parameter	Unit	Alternative-1:Steam generation using coal	Alternative-2: Steam generation using biomass without CDM benefit
Unit Cost	Rs./ton of steam	669	773

As evident from the table above, Unit cost of steam generation for Alternative-2 is more than that in Alternative -1 and hence it can be concluded that Alternative-1 would be the choice for steam generation for the project proponent in the absence of the project activity. Besides this Alternative- 2 faces many barriers (refer section B.5 of the document for additionality) and hence cannot become a plausible baseline option for energy generation for the project proponent. Hence the most plausible baseline scenario for this project activity is “Steam generation using coal”.

Since the project activity is using coal in the baseline for steam generation, therefore baseline emission is calculated as per para 10 of the small scale methodology AMS I. C version 13.

According to the para 10, the baseline emission is calculated as per the equation below:

[7] As per coal invoice

$$BE_y = HG_y * EF_{CO2} / \eta_{th} \quad \textbf{(1)}$$

Where:

BE_y the baseline emissions from steam/heat displaced by the project activity during the year y in tCO_2e.

HG_y the net quantity of steam/heat supplied by the project activity during the year y in TJ.

EF_{CO2} the CO_2 emission factor per unit of energy of the fuel that would have been used in the baseline plant in (tCO_2 / TJ), obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used.

η_{th} the efficiency of the plant using fossil fuel that would have been used in the absence of the project activity.

Data requirement and sources for baseline emission estimation:

Parameter	Unit	Data source
Net energy output of boiler (HG_y)	TJ/annum	Plant
Emission factor of coal (EF_{CO2})	tCO_2/TJ	IPCC
Boiler efficiency on coal (η_{th})	%	As per methodology AMS I.C, Para 13. This value is being used to calculate the baseline emission.

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 additionality of the project activity is explained on the basis of barrier analysis mentioned in Attachment A to Appendix B of Simplified modalities and procedures for small scale project activities. Attachment A to Appendix B mentions the barriers listed below and at least one of the listed barriers should be explained to show that the project activity could not be undertaken due to the barrier and that the CDM revenue would significantly act as an impetus for the project to survive.

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

As mentioned above the project proponent has two alternatives to generate thermal energy required for the process; however it may be noted that alternative 2 *i.e.* ‘Use of biomass in the boiler (rice husk and other agricultural residues) as fuel source’ faced following barriers which are detailed below:

Investment barrier:
The project activity entails the installation of a biomass based boiler for steam generation. The extracted steam would be utilized for the process heating purpose in the plant. The total investment in the project is

approximately Rs. 183.45 Lacs[8]. This includes the cost of boiler and its accessories, civil works etc. Here we would analyse the project financial viability in terms of fuel cost analysis. The fuel cost analysis has been done based on unit cost of energy generation for biomass and the baseline scenario i.e. coal. In this analysis we have considered the cost of project activity to be same for both the cases. The efficiency for both the cases has been considered as per the purchase order of the boiler. Other factors e.g. required rate of return on equity, insurance and depreciation rate have been considered to be the same for both the cases for comparison. The landed cost of coal used in the baseline scenario has been taken from coal invoice. The landed cost of biomass in project activity has been obtained from supplier's quotation. The calorific values used for the unit cost analysis have been obtained from the plant laboratory. The calorific values have been measured using a Bomb Calorimeter in the plant laboratory. The measured calorific value of coal and biomass are in the range of 4500-4800 Kcal/Kg and 2200-2500Kcal/Kg respectively. Therefore using a conservative approach, the lowest calorific value for coal and highest calorific value for biomass has been considered in this analysis. The assumptions considered for the cost comparison are tabulated below:

Financial parameters:

Description	Details	Remarks
Project cost (Rs. Lacs)	183.45	The value is taken from DPR. It includes cost of Boiler, chimney work, erection of boiler, ash handling system, civil works etc. This is considered to be the same for both the alternatives.
Equity (%)	100%	Considered same for both the alternatives.
O & M (%)	3.5%	The value is taken from DPR. This is considered to be the same for both the alternatives.
Cost of equity (%)	14%	The value is taken from DPR. This is considered to be the same for both the alternatives.
Depreciation (%)	4.5%	The value is taken from DPR. This is considered to be the same for both the alternatives.
Coal Price (Rs./MT)	4000	The coal price as referred form the coal invoice is Rs. 3000/MT, but the landed cost of coal is amount to Rs. 4000/MT as considered in the financial analysis. The transportation cost has been taken to be Rs 1000/MT, which is a conservative estimate based on the invoice of Rs 660/MT.
Biomass price (Rs./MT)	2500	As per Supplier quotation landed cost of biomass is Rs.2500-2550/MT. Being conservative, we have taken Rs.2500/MT for cost comparison.

Technical parameters:

Description	Details	Remarks
Quantity of steam generated (TPH)	15	As per Technical specification of the boiler
Pressure of steam (Kg/cm^2)	21	As per Technical specification of the boiler
Temperature of steam	Saturated	As per Technical specfication of the boiler

[8] 1 million = 10 lacs

(Deg C)		
Boiler efficiency (On coal)	81%	As per the applied methodology, Page 3, para 13, Maximum efficiency of 100% of baseline coal based boiler has been considered in emission reduction and to be on more conservative side, the design efficiency 81% of coal based boiler (As per offer for 15TPH coal fired boiler from Cheema boiler) has been considered to evaluate the project financial viability in terms of cost comparison analysis.
Boiler efficiency (On Biomass)	78%	As per technical specification of the boiler
Coal calorific value	4500 Kcal/Kg	Measured value. The calorific value has been measured using a Bomb Calorimeter in the plant laboratory.
Biomass calorific value	2500 Kcal/Kg	Measured value. The calorific value has been measured using a Bomb Calorimeter in the plant laboratory.
Feed water inlet temperature (Deg C)	105	The value is taken from Bureau of Energy Efficiency (BEE) Handbook for boilers (Page no 49).
Plant Load Factor	70%	The value is taken from DPR. This is considered to be the same for both the alternatives.

Based on the values above, the cost comparison has been carried out for equivalent steam generation for both the options. The comparison is shown below:

Parameter	Unit	Coal Based steam generation	Biomass based steam generation
Cost of equity	Rs. (Lacs)	25.68	25.68
Depreciation	Rs. (Lacs)	8.26	8.26
Total Fixed cost	Rs. (Lacs)	**33.94**	**33.94**
Fuel cost	Rs. (Lacs)	498.80	582.73
O & M cost	Rs. (Lacs)	6.42	6.42
Total Variable cost	Rs. (Lacs)	**505.22**	**589.15**
Total cost (Fixed + Variable)	**Rs. (Lacs)**	**539.16**	**623.09**
Total steam generation	TPA	80640	80640
Unit Cost	Rs./ton	669	773

As demonstrated above the use of coal is the most cost effective option. It is evident from the table above that the unit generation of energy using biomass as fuel is costlier than that a coal fired generation. Hence the project activity is not a business-as-usual and not the baseline scenario.

Sensitivity Analysis: For the sensitivity analysis, the main uncertainties are cost of biomass and efficiency of the biomass boiler.

Cost of Fuel: It has been observed that biomass prices increased significantly because of improper collection mechanism, inconsistency in production, lake of a structured and established market etc.
The changes in unit cost of steam production with different fuel cost are shown in table below:

Changes in unit cost of steam production with cost of fuel

Scenario	Unit cost of steam production On coal	Unit cost of steam production On Biomass
Biomass price increased by 10% and coal price remains constant	Rs. 669	Rs. 845
Coal price increased by 10% and biomass price remains constant	Rs. 730	Rs. 773
Biomass price decreased by 10% and coal price remains constant	Rs. 669	Rs. 701
Coal price decreased by 10% and biomass price remains constant	Rs. 607	Rs. 771

Boiler efficiency: The efficiency of a boiler depends on various factors like bulk density of fuel, calorific value, moisture content of fuel etc. The improper storage and transport of biomass and moisture content in biomass more than normal in monsoon season adversely affect on the calorific value of biomass which directly affect the performance of biomass based system and unit cost of energy generation. The changes in unit cost of energy production with different efficiencies of boiler are tabulated below:

Changes in unit cost of steam production with efficiency of boiler

Scenario	Unit cost of steam production on Coal	Unit cost of steam production on Biomass
Biomass boiler eff. increased by 10% and coal boiler eff. remains constant	Rs. 669	Rs. 707
Coal boiler eff. increased by 10% and biomass boiler eff. remains constant	Rs. 612	Rs. 773
Biomass boiler eff. decreased by 10% and coal boiler eff. remains constant	Rs. 669	Rs. 853
Coal boiler eff. decreased by 10% and biomass boiler eff. remains constant	Rs. 737	Rs. 773

The conclusion of the sensitivity analysis is that the unit cost of steam production is very sensitive to boiler efficiency and fuel cost. For all analyzed cases, the unit cost of steam production in the project activity is well above the unit cost of baseline scenario. Even in the case of a maximum decreased in biomass price, the unit cost of steam production is well above the baseline scenario. In the case of efficiency decreased or increased by 10%, the unit cost of energy production goes above unit cost of energy generation in baseline scenario.

Technological barrier:
Biomass utilization in boiler does create some technical challenges. Such challenges may include physical processing of the biomass for proper injection or feeding into the boiler, fireside performance of

the biomass and its impact on flame stability, boiler heat exchanger surface fouling or slagging, and corrosion. Ash deposition and boiler tube corrosion can also be an issue because biomass can contain considerable alkali and alkaline-earth elements and chlorine which, when mixed with other gas components promote a different array of vapor and fine particulate deposition in the boiler[9].

The biomass based boiler installed in this project activity has lower efficiency as compared to coal based boiler. The boiler efficiency offered by the technology supplier is in the range of 74-78% which is below than the coal fired boiler (81-85%)[10]. The efficiency difference would affect the fuel consumption rate in boiler and hence it would cost more for the same energy output. The factors that affect the efficiency of a boiler include bulk density of fuel, energy density of fuel and its calorific value. The low bulk density and low energy density of biomass lowers the performance of a biomass based system[11]. The tendency of lower bulk density of biomass also translates into higher transportation cost and storage cost[12]. Their lower bulk density also means that special consideration must be given to storage, handling and feeding them into combustion systems.

The other problems with biomass combustion are the higher level of moisture content and presence of impurities. The moisture content of a single source of biomass fuel delivered to a plant can vary significantly because of differences in factors such as harvesting, storage, transportation, and drying conditions. The moisture content of biomass may also vary depending upon the season. In the monsoons, the moisture content will be comparatively more as compared to the other seasons. The presence of moisture more than normal would not only affect the performance of the boiler but also result in increased effective cost of biomass and energy generation[13].

Again, the biomass procured is adulterated with impurities such as scrap materials, rock, dust particle, metals, glass and other biomass such as leaves, straw etc. The presence of impurities may cause the plugging and mechanical breakdown of boiler equipments. The presence of glass and metal may cause sintering and fouling of boiler equipments[14]. Presence of impurities can also provide incorrect estimates of the biomass requirement for energy generation. In addition to this the effective cost of biomass is also increased affecting project's viability.

Other barriers:

Seasonal availability of biomass:

The success of a biomass project mainly depends on the availability of biomass materials. Biomass availability is highly subject to seasonal fluctuations due to the vagaries of nature. The other most important aspect for sustainable availability of biomass to the project activity is proper management of procurement, transportation and storage of biomass.

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[9] http://www.osti.gov/energycitations/servlets/purl/791079-K0YZWO/native/791079.PDF

[10] Boiler purchase order

[11] http://www.abe.psu.edu/extension/factsheets/h/H82.pdf

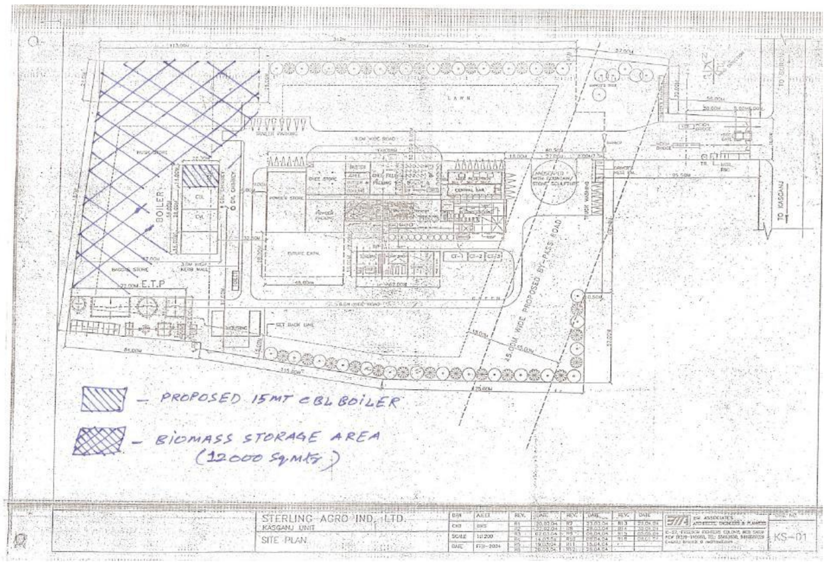
[12] http://www.osti.gov/energycitations/servlets/purl/791079-K0YZWO/native/791079.PDF

[13] http://www.soi.wide.ad.jp/class/20070041/slides/01/40.html

[14] http://www.osti.gov/energycitations/servlets/purl/791079-K0YZWO/native/791079.PDF

Procurement, transportation and price fluctuation of biomass: Procurement and transportation of biomass in such a huge quantity (23309 MT/year) to the project site is a big constraint for project's successful operation. This is because of factors like biomass is widely dispersed in small quantities and absence of a formal market for continuous supply of biomass. These factors may not only create availability issues but may also impact the prices of biomass severely. The procurement of biomass would be a daunting task as it is involved the setting up of a system for the collection of biomass from large number of sellers, since one single supplier cannot supply the quantity of biomass required for the project activity. In addition to this, the cost of procurement will increase every year as per the trend in the cost of labour.

Storage of biomass: The availability of biomass residues are season dependent. In India, it is largely monsoon based. To ensure a sustainable supply of biomass to this project activity, adequate storage facilities are required, which in turn occupied lots of space in the plant. The project activity has proposed a storage area of 12,000 square meters. The storage area is depicted in the following picture.



Moreover, the characteristics of biomass fuel change quickly within a very short time, mainly the calorific value decreases due to loss of volatiles[15], which adversely affects on the performance of the boiler.

Summary:

As discussed in above sections, project activity can not be considered a natural choice for steam generation. There are a number of barriers for such projects to come up. Besides, it is not the most cost effective way for steam generation. However, CDM benefits accruing from the project activity would support it financially and to some extent cover the risks involved.

CDM Consideration:

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[15] http://www.biomassenergycentre.org.uk/portal/page?_pageid=75,17306&_dad=portal&_schema=PORTAL

As per the **GUIDANCE ON THE DEMONSTRATION AND ASSESSMENT OF PRIOR CONSIDERATION OF THE CDM** –

(a) The project participant must indicate awareness of the CDM prior to the project activity start date, and that the benefits of the CDM were a decisive factor in the decision to proceed with the project. Evidence to support this would include, inter alia, minutes and/or notes related to the consideration of the decision by the Board of Directors, or equivalent, of the project participant, to undertake the project as a CDM project activity.

(b) The project participant must indicate, by means of reliable evidence, that continuing and real actions were taken to secure CDM status for the project in parallel with its implementation. Evidence to support this should include, inter alia, contracts with consultants for CDM/PDD/methodology services, Emission Reduction Purchase Agreements or other documentation related to the sale of the potential CERs (including correspondence with multilateral financial institutions or carbon funds), evidence of agreements or negotiations with a DOE for validation services, submission of a new methodology to the CDM Executive Board, publication in newspaper, interviews with DNA, earlier correspondence on the project with the DNA or the UNFCCC secretariat;

Following demonstrates the serious consideration of CDM benefits by PP in implementation of the project under discussion-

Sterling Agro Industries Ltd. seriously considered the CDM benefits before implementation of the project. Following is the trail of events in the project activity -

Following are the timelines of the project –
-

S.N.	Events	Date
1	Preparation of Detailed project report	December-2007
2	Offer from Cheema boiler for 15TPH coal fired boiler.	05/01/2008
3	Offer from Cheema boiler for 15TPH biomass fired boiler.	15/01/2008
4	Board decided to go ahead with CDM	18/01/2008
5	Purchase order placed for biomass fired boiler	22/01/08
7	Offer from CDM advisor	08/04/08
8	Approval from director of boilers, U.P.	18/06/08
11	Engagement of CDM advisor	04/07/08
12	Consent to establish from director of boilers	16/07/08
13	News Paper advertisement published	Rajpath in English (dated on 05/07/08). Rajpath in Hindi (dated on 10/07/08) Pravada (dated on 16/07/08)
14	Validation proposal from DOE	23/07/08
15	Engagement of DOE	30/07/08
16	PDD and PCN submitted to MoEF	22/08/08
17	Interviews with DNA	17/10/08

18	PDD webhosting	23/10/08
19	Commissioning trial and Bank tube damage	20/02/09
20	Validation site visit	19/03/09
21	Expected date of commissioning	May-June 2009

The above information demonstrates that not only Project proponent considered CDM benefits during the decision making process but also started the project registration process along with the implementation of project.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

As discussed in section B-4, the baseline for the project activity is steam generation using coal, therefore baseline emission is calculated as per para 10 of the small scale methodology AMS I. C version 13.

Baseline emission (BE_y):
According to the para 10, the baseline emission is calculated as per the equation below:

$$BE_y = HG_y * EF_{CO2} / \eta_{th} \qquad (1)$$

Where,

BE_y the baseline emissions from steam displaced by the project activity during the year y in tCO2e.

HG_y the net quantity of steam supplied by the project activity during the year y in TJ.

EF_{CO2} the CO2 emission factor per unit of energy of the coal that would have been used in the baseline plant in (tCO2 / TJ), IPCC default emission factor is used (96.1 tCO2/TJ).

η_{th} the efficiency of the boiler using coal that would have been used in the absence of the project activity.

Project Emission (PE_y):
There are no project activity emissions as this is a renewable project activity. However, small quantity of fossil fuel would be used for start up the boiler and as co-firing in the project activity. Project emissions on account of use of fossil fuel would be considered and monitored as per the "**Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", version-02, EB41**[16]
.
Project Emissions due to Auxiliary Fuel (e.g. Coal) Consumption is estimated as per the following equation:

[16] http://cdm.unfccc.int/methodologies/Tools/meth_tool03_v02.pdf

$$PE_{FC,j,y} = \sum_{i} FC_{i,j,y} \times COEF_{i,y} \quad (2)$$

Where

$PE_{FC,j,y}$ (tCO2/yr)	Are the CO2 emissions from fossil fuel combustion in process j during the year *y*
$FC_{i,j,y}$ unit/yr)	the quantity of fuel type *i* combusted in process *j* during the year *y* (mass or volume
$COEF_{i,y}$	the CO2 emission coefficient of fuel type *i* in year *y* (tCO2/mass or volume unit)
i	the fuel types combusted in process *j* during the year *y*

The CO2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type *i*, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \quad (3)$$

Where,

$COEF_{i,y}$	the CO2 emission coefficient of fuel type i in year *y* (tCO2/mass or volume unit)
$NCV_{i,y}$	the weighted average net calorific value of the fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$	the weighted average CO2 emission factor of fuel type *i* in year *y* (tCO2/GJ)
i	the fuel types combusted in process *j* during the year *y*

Leakages (L_y):

A. **As per the "General guidance on leakage in biomass project activities, Version 02, EB 28"** leakage estimation has been done as below:

The project activity proposes using surplus biomass (rice husk) available surplus in the region. The guidance has highlighted three distinct possibilities of leakage in biomass usage.

Biomass type	**Activity/source**	**Shift of pre-project activities**	**Emission from biomass generation/cultivation**	**Competing use of biomass**
Biomass from forest	Existing forest	-	-	X
	New forest	X	X	-

Biomass from croplands or grasslands (woody or non woody)	In the absence of the project the land would be used as cropland/wasteland	X	X	-
	In the absence of the project activity land would be abandoned	-	X	-
Biomass residues or wastes*	Biomass residues or wastes are collected and used	-	-	X

*Applicable to the project activity.

The project activity involves procurement of biomass residue available in the region. The biomass would be procured from selected parts of Aligarh, Mathura, Agra, Hathras, Firozabad, Mainpuri, Bareilly and Etah districts constituting Agra Mandal and area covered within 90 km radius from Etah district. For this as per the guidance, the project participant shall evaluate annually if there is a surplus of the biomass in the region of the project activity, which is not utilized. It will be demonstrated using published literature, official reports, surveys etc. that the quantity of available biomass in the region, is at least 25% larger than the quantity of biomass that is utilized including the project activity, then this source of leakage can be neglected otherwise this leakage shall be estimated and deducted from the emission reductions.

There is enough biomass residue available in the region that goes unutilized and hence leakage emissions on account of competing use of this biomass residue has not been considered. However, this will be monitored annually which will be available during verification.

In case when the biomass residues available in the region is not at least 25% higher than the quantity of biomass that is utilized including the project activity, following procedure would be adopted for estimation of leakage-

$$Ly = EF_{CO2,LE} * \sum BF_{k,y} * NCV_k \quad (4)$$

Where;

L_y = Leakage emissions during year y, tCO2
$EF_{CO2, LE}$ = CO2 emission factor of the most carbon intensive fuel used in the country, tCO2/ GJ, National Emission Factor Value (0.1062 tCO2/GJ for Lignite)[17]
$BF_{k,y}$ = Quantity of biomass residue k used in project activity not available in surplus in the region in year y
NCV_k = Net calorific value of biomass residue k, GJ/ tonne

[17] http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver3.pdf

B. Leakage due to transfer of equipments to/ from the project activity

As per the methodology, if the equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered. The equipments installed in the project activity are not transferred from any other activity. Besides, no existing equipment has been transferred from the project site. Hence leakage for this part is zero.

C. Leakage due to transportation of biomass to the plant site

The project activity is not expected to cause any leakage emissions due to transportation of biomass; rather it is expected to result in reduced leakage emissions due to reduced transportation of fuel. In the pre-project scenario coal was procured from the mines located at a distance of around 300-350 kms from the project site, where as in the post project scenario the project activity the biomass is procured from in a region of max 100 kms from the project site. However being conservative the project proponent is not claiming any emission reductions due to reduced fuel transportation.

Emission reduction (ER_y):

The emission reduction achieved by the project activity will be the difference between the baseline emission and the sum of the project emission and leakage.

$$ER_y = BE_y - (PE_y + L_y) \qquad (5)$$

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

(Copy this table for each data and parameter)

Data / Parameter:	EF_{CO2}
Data unit:	tCO2/TJ
Description:	The CO_2 emission factor per unit of energy of coal that would have been used in the baseline plant in absence of the project activity
Source of data used:	IPCC default value
Value applied:	96.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	National and local data is not available for this parameter; therefore IPCC default value is used.
Any comment:	-

Data / Parameter:	η_{th}
Data unit:	%
Description:	The efficiency of the baseline coal fired boiler
Source of data used:	As per methodology AMS I.C, Para 13. This value is being used to calculate the baseline emission.
Value applied:	100
Justification of the choice of data or description of measurement methods	The data is transparent and verifiable.

and procedures actually applied :	
Any comment:	-

B.6.3 Ex-ante calculation of emission reductions:

Baseline emission (BE_y):
The baseline emission is calculated based on equation (1) described in section B.6.1 of this PDD:

$BE_y = HG_y * EF_{CO2} / \eta_{th}$

BE_y = 15TPH × 7680 hrs/annum × (2799.3 – 439.3) KJ/kg × 70% × 96.1 tCO2/TJ × 10^{-6} / 100%
= 18289 tCO2/ annum

Project Emission (PE_y):
The project emission is calculated based on equation (2) described in section B.6.1 of this document:

$PE_{,y} =$ 0 (For ex-ante estimation)

Leakages (L_y):
As described in section B.6.1 of this document, the ex-ante estimation of Leakage emission is zero for the project activity.

Emission reduction (ER_y):
The emission reduction achieved by the project activity will be the difference between the baseline emission and the sum of the project emission and leakage and is calculated based on equation (3) in section B.6.1 of this document.

$ER_y = BE_y – (PE_y + L_y)$
ER_y = 18289 – (0 + 0) = 18289 tCO2/annum

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

Year	Estimation of project activity emissions (tCO2e)	Estimation of baseline emissions (tCO2e)	Estimation of leakage (tCO2e)	Estimation of overall emission reductions (tCO2)
2009-10	0	18289	0	18289
2010-11	0	18289	0	18289
2011-12	0	18289	0	18289
2012-13	0	18289	0	18289
2013-14	0	18289	0	18289
2014-15	0	18289	0	18289

2015-16	0	18289	0	18289
2016-17	0	18289	0	18289
2017-18	0	18289	0	18289
2018-19	0	18289	0	18289
Total (tonnes of CO2 e)	**0**	182890	**0**	182890

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:	**$Q_{steam, i}$**
Data unit:	Tonne
Description:	Quantity of steam generated
Source of data to be used:	Onsite measurement
Value of data	-
Description of measurement methods and procedures to be applied:	Directly measured using steam flow meter. Data will be monitored on daily basis.
QA/QC procedures to be applied:	Steam flow meter will be calibrated/ checked annually as per manufacturer's prescribed standards.
Any comment:	-

Data / Parameter:	**$T_{steam. i}$**
Data unit:	Degree C
Description:	Temperature of the steam generated
Source of data to be used:	On-site measurement
Value of data	
Description of measurement methods and procedures to be applied:	Measured using on-site temperature gauge. The data will be monitored on daily basis.
QA/QC procedures to be applied:	Gauge will be tested annually as per manufacturer's prescribed standards.
Any comment:	-

Data / Parameter:	**$P_{steam, i}$**
Data unit:	Kg/cm^2
Description:	Pressure of the steam generated
Source of data to be used:	On-site measurement
Value of data	

Description of measurement methods and procedures to be applied:	Measured using on-site pressure gauge. The data will be monitored on daily basis.
QA/QC procedures to be applied:	Gauge will be tested annually as per manufacturer's prescribed standards.
Any comment:	-

Data / Parameter:	$\mathbf{E_{steam,\ i}}$
Data unit:	Kcal/kg
Description:	Enthalpy of the steam generated
Source of data to be used:	Estimated based on steam temperature and pressure using steam table.
Value of data	
Description of measurement methods and procedures to be applied:	Estimated value based on steam temperature and pressure
QA/QC procedures to be applied:	This is an estimated value. No need of QA/QC procedure.
Any comment:	-

Data / Parameter:	$\mathbf{T_{FW,\ i}}$
Data unit:	Degree C
Description:	Temperature of the feed water into boiler
Source of data to be used:	On-site measurement
Value of data	
Description of measurement methods and procedures to be applied:	Measured using on-site temperature gauge. The data will be monitored on daily basis.
QA/QC procedures to be applied:	Gauge will be calibrated annually as per manufacturer's prescribed standards.
Any comment:	-

Data / Parameter:	$\mathbf{E_{FW,\ i}}$
Data unit:	Kcal /kg
Description:	Enthalpy of feed water into boiler
Source of data to be used:	Estimated based on feed water temperature using steam table.
Value of data	
Description of measurement methods and procedures to be applied:	Estimated value based on feed water temperature.
QA/QC procedures to	This is an estimated value. No need of QA/QC procedure.

be applied:	
Any comment:	-

Data / Parameter:	$\mathbf{Q_{biomass, i,y}}$
Data unit:	Kg
Description:	Quantity of biomass of type i combusted in year y
Source of data to be used:	On-site measurement
Value of data	
Description of measurement methods and procedures to be applied:	Quantity of biomass used in project activity would be measured using weigh scales and recorded in Log books.
QA/QC procedures to be applied:	The data will be cross checked with the biomass procurement data.
Any comment:	-

Data / Parameter:	$\mathbf{Q_{fossil, i,y}}$
Data unit:	Kg
Description:	Quantity of fossil fuel of type i combusted in year y
Source of data to be used:	On-site measurement
Value of data	
Description of measurement methods and procedures to be applied:	Quantity of fossil fuel used in project activity would be measured using weigh scales and recorded in Log books.
QA/QC procedures to be applied:	The data will be cross checked with the fossil fuel procurement data.
Any comment:	

Data / Parameter:	$\mathbf{NCV_{biomass, i}}$
Data unit:	KJ/kg
Description:	Net calorific value of biomass of type i used
Source of data to be used:	Plant laboratory
Value of data	
Description of measurement methods and procedures to be applied:	Measurement will be done in plant laboratory using Bomb calorimeter. The data will be monitored annually. A bomb calorimeter is a type of constant-volume calorimeter used in measuring the heat of combustion of a particular reaction. Bomb calorimeters have to withstand the large pressure within the calorimeter as the reaction is being measured. Electrical energy is used to ignite the fuel, as the fuel is burning, it will heat up the surrounding air, which expands and escapes through a tube that leads the air out of the calorimeter. When the air is escaping through the copper tube it will also heat up the water outside the tube. The temperature of the water allows for calculating calorie content of the fuel. The

	CV measured by the Bomb calorimeter is Gross Calorific value. The conversion of GCV to NCV would be carried out by analyzing fuel characteristics and using algorithm as per IPCC-2006 guidelines, Volume-2 (Energy), Chapter-1(Introduction), page no-1.17.
QA/QC procedures to be applied:	Bomb calorimeter will be calibrated annually as per manufacturer's prescribed standards.
Any comment:	-

Data / Parameter:	**$NCV_{ff, i}$**
Data unit:	KJ/kg
Description:	Net calorific value of fossil fuel of type i used
Source of data to be used:	Plant laboratory
Value of data	
Description of measurement methods and procedures to be applied:	Measurement will be done in plant laboratory using Bomb calorimeter. The data will be monitored annually. Measurement will be done in plant laboratory using Bomb calorimeter. The data will be monitored annually. A bomb calorimeter is a type of constant-volume calorimeter used in measuring the heat of combustion of a particular reaction. Bomb calorimeters have to withstand the large pressure within the calorimeter as the reaction is being measured. Electrical energy is used to ignite the fuel, as the fuel is burning, it will heat up the surrounding air, which expands and escapes through a tube that leads the air out of the calorimeter. When the air is escaping through the copper tube it will also heat up the water outside the tube. The temperature of the water allows for calculating calorie content of the fuel. The CV measured by the Bomb calorimeter is Gross Calorific value. The conversion of GCV to NCV would be carried out by analyzing fuel characteristics and using algorithm as per IPCC-2006 guidelines, Volume-2 (Energy), Chapter-1(Introduction), page no-1.17.
QA/QC procedures to be applied:	Bomb calorimeter will be calibrated annually as per manufacturer's prescribed standards.
Any comment:	-

Data / Parameter:	**Biomass availability**
Data unit:	Tonnes
Description:	Surplus biomass availability in the region
Source of data to be used:	To be based on publicly available reports on biomass availability in the region from state or central Government agencies and/ or other institutions of repute OR Sterling Agro Industries Ltd. would carry out its own assessment through external experts/ in-house resources in case of non-availability of such information otherwise. The assessment would be done annually.
Value of data	
Description of measurement methods and procedures to be applied:	-
QA/QC procedures to	No need of QA/QC procedure

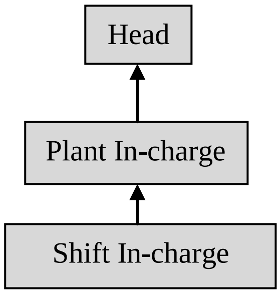
be applied:	
Any comment:	-

B.7.2 Description of the monitoring plan:

The project proponent has proposed the following structure for data monitoring, collection, data archiving and calibration of equipments for this project activity. The team comprises of the following members.

1. Head
2. Plant In-charge
3. Shift In-charge

Organisational Structure for Monitoring



Responsibilities of Head: Overall functioning and maintenance of the project activity.

Responsibilities of Plant In-charge: Responsibility for Maintains the data records, ensures completeness of data, and reliability of data (calibration of equipments).

Responsibilities of Shift In-charge: Responsibility for day to day data collection and maintains day to day log book for monitored data.

Personnel training: In order to ensure a proper functioning of the project activity and a properly monitoring of emission reductions, the staff will be trained to enable them undertaking necessary tasks in a transparent and credible approach. The operator personnel will be trained in equipment operation, data recording, reports writing, operation and maintenance and emergency procedures in compliance with the monitoring plan.

Data source: As per section B.7.1

Data collection and record keeping: Data will be collected at the plant operation site under the supervision of the shift-in-charge and records will be maintained in daily logs. The reports are checked periodically by the Plant In-charge and discussed thoroughly with the data monitoring personnel. A separate log will also be maintained for the biomass supply on the site, its storage and usage in the project activity.

Reliability of data collected: The reliability of the measuring equipments will be calibrated as per section B.7.1. Documents pertaining to testing of equipments shall be maintained by Plant In-charge.

Frequency of monitoring: As per section B.7.1

Archiving of data: All data collected as part of monitoring should be archived in paper and be kept at least for 2 years after the end of the last crediting period.

Maintenance of instruments and equipments: Instruments will be subject to regular maintenance and cross-checking regime with a minimal frequency of once a year. The Operations Department shall be responsible for the proper functioning of the equipments/ instruments and shall take a corrective action if found not operating, as required.

Emergency preparedness: The project activity will not result in any unidentified activity that can result in substantial emissions from the project activity. No need for emergency preparedness in data monitoring is visualized.

Emission reduction calculation: Emission reduction calculations and monitoring report will be done annually based on the data collected. This will be done by the team. The monitoring report and the emission reduction calculation will be maintained by the head for verification.

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

The baseline and monitoring was completed on 23/07/2008 by the project proponent.

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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:

22/01/2008 (date of Purchase order of the biomass fired boiler)

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

20 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:

NA

C.2.1.2. Length of the first crediting period:

NA

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

The start date of the crediting period is 01/10/2009 or a date not earlier than the date of registration of the small scale project activity

C.2.2.2. Length:

10 years

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 Biomass based energy generation project does not require an Environmental Impact Assessment (EIA). As per the Ministry of Environment and Forests (MoEF), Government of India notification dated September 14th, 2006[18] regarding the requirement of EIA studies as per the Environment Protection Rule, 1986 (MoEF, 2002) is not required for this project activity.

The project activity involves the use of biomass residue as fuel for steam generation and displacement of fossil fuels. There is no adverse impact by the project activity on air, water and soil. It has only positive impacts in terms of GHG emission reduction.

[18] http://envfor.nic.in/legis/eia/so1533.pdf

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:

Sterling Agro Industries Ltd. has fulfilled the requirements stipulated under state and central laws for establishment of the biomass boiler.

SECTION E. Stakeholders' comments

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

Stakeholder consultation for the project activity has been conducted to account for the views of the people impacted either directly or indirectly due to the project activity. This has been carried out at all levels of stakeholders –

A. District Magistrate
B. Local gram panchayat
C. Local community

The project proponent informed and requested all stakeholders about their views regarding the project activity. A letter was sent to *the District Magistrate,(Kasganj), Kashiram Nagar dated on 28/08/08* and Gram Panchayats of Soron road, Kasganj, Kanshiram Nagar dated on 28/08/08 with the details of the project activity and request for their suggestions. An advertisement was also published to inform local people regarding the project activity. The newspaper advertisement describes in brief about the project activity, the benefits associated with the project activity and ask for the views from local people.

A meeting was also held with villagers at the plant site on 28/08/08. Meeting presided with the brief introduction of the Villagers and representatives and investors. Mr. Vimal Agrawal, Director, Sterling Agro Industries Ltd. briefed about the agenda of the meetings and introduced the Global Warming, Climate Change and CDM. He also explained about the project activity and how the identified project fulfil the requirements of CDM and the purpose of meeting as to seek the concern, opinion and suggestion of the villagers.

E.2. Summary of the comments received:

People participated with great enthusiasm and raised a few questions, which were answered to in an appropriate manner by the project proponent. Summary of these comments is given as follows;

Queries and responses from the proponent and the stakeholders:

1. What are green house gases and how it impacts on environment?

Ans: The gases like CO_2, N_2O those emit from burning of fossil fuel is called green house gases.

2. What are the benefits of this project on environment and people at large?

Ans: The project activity involves the installation of biomass boiler for energy generation and it will reduce the air and water pollution.

3. What are the negative impacts of this project?

Ans: There is no negative impact of this project activity. The proposed activity does not use additional fossil fuel and does not lead to any additional emission of pollutants.

4. While implementing the project, could the developer do something which would be helpful to the local population?

Ans: The project activity will result in lower GHG emissions to the surrounding environment and thus improve the local environment for people living in close proximity.

5. What is the opinion of the gram panchayat for this project activity?

Ans: The comments received from gram panchayat can be summarized as positive and implementation of the project activity is also appreciated.

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

The gram pranchayat and villagers expressed their happiness & thanked for calling them for discussion. There were no negative comments received from the stakeholders.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Represented by:	
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding of any kind is involved in the project activity.

Annex 3

BASELINE INFORMATION

Applicability of small scale methodology (AMS – IC)

Parameter	Unit	Details
Qty of steam generated	TPH	15
Pr. of steam	kg/cm2	21
Temp of steam	Deg C	Saturated Steam
Enthalpy of steam	kJ/kg	2799.3
Enthalpy of feed water	kJ/kg	439.3
Net Energy output of boiler at rated capacity	kJ/kg	2360.0
Total thermal energy output	KJ/hr	35400.45
Thermal output from boiler	MWth	9.83

Please refer section B.4 for baseline information.

Annex 4

MONITORING INFORMATION

Please refer section B.7

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