Voluntary Carbon Standard

Date of VCS PD- 7 November 2009
Version: 03

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1 Description of Project:

1.1 Project title

"Bundled Biomass Based Thermal Energy Projects in U.P. & Punjab of Sukhbir Agro Energy Limited"
Version: 03

1.2 Type/Category of the project

The VCS program approves the use of "Clean Development Mechanism" (CDM) methodologies framed by CDM EB, UNFCCC. Accordingly, the project activity in this case uses one of the CDM baseline and monitoring methodologies.

The methodology used for the project activity is AMS I C – "Thermal Energy for the user, with or without electricity" Version 13[1]: approved during 38th meeting of the CDM Executive Board i.e. EB-38.

The project is a grouped project. This is applicable in accordance with VCS 2007.1[2] that states "a project can be grouped when a number of projects and their related methodologies included in a single VCS Project Description (VCS PD) at the time of the validation." The above project includes two project activities under single methodology AMS IC in the VCS PD hence can be termed as a grouped project.

1.3 Estimated amount of emission reductions over the crediting period including project size:

Year	Estimated Annual Emission Reductions in tCO_2e
30 –Aug-2007 to 29-Aug 2008	26,883
30 –Aug-2008 to 29-Aug 2009	26,883
30 –Aug-2009 to 29-Aug 2010	26,883
30 –Aug-2010 to 29-Aug 2011	26,883
30 –Aug-2011 to 29-Aug 2012	26,883
30 –Aug-2012 to 29-Aug 2013	26,883
30 –Aug-2013 to 29-Aug 2014	26,883
30 –Aug-2014 to 29-Aug 2015	26,883
30 –Aug-2015 to 29-Aug 2016	26,883
30 –Aug-2016 to 29-Aug 2017	26,883
Total Estimated Reductions (tCO_2e) for 10 years crediting period	268,830
Total Number of Crediting Years	10 Years

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

[2] http://www.v-c-s.org/docs/Voluntary%20Carbon%20Standard%202007_1.pdf

Annual Average of the Estimated Reductions over the Crediting Period (tCO_2e)	26,883

As per the VCS program guidelines 2007.1, projects are divided into three groups:

- **Micro projects**: under 5,000 tCO2 emission reductions per year;
- **Projects**: 5,000 – 1,000,000 tCO2 emission reductions per year; and
- **Mega projects**: greater than 1,000,000 tCO2 emission reductions per year.

The project falls under the group "Projects" since the amount of emission reductions are in the range of 5,000-1,000,000 i.e. 26,883 tCO2-e per year.

1.4 A brief description of the project:

The project activity is a bundled biomass based heat generation project activity consisting of one rice husk fired boiler of M/s Sukhbir Agro Energy Ltd and one of M/s Sri Ram Solvex.

Sukhbir Agro Energy Limited (SAEL) is a leading rice producer in the Ghazipur region of Uttar Pradesh. The capacity of the rice mill is 50 TPH of paddy processing. Steam is a vital utility to perform number of operations during the manufacturing of rice.

Sri Ram Solvex is a rice bran oil manufacturing company located in Ferozepur, Punjab. The capacity of the unit is 100 TPD of rice bran processing. It also requires steam to meet its captive heat demand.

The project proponents considered the options of using coal fired boiler or biomass (rice husk) fired boilers for production of steam. Considering the fact that rice husk is a renewable source of energy and use of rice husk would prevent use of coal, a carbon intensive fossil fuel, the project proponents decided to install a rice-husk fired boiler to meet its process steam requirement. The project activity involves installation of a 10 TPH and 3 TPH rice husk fired boilers by SAEL and SRS respectively. The annual estimated rice husk requirement of the boilers is 17068.78 and 4874.42 tons respectively. The project activity leads to avoidance of consumption of fossil fuel for the generation of process steam and consequently contributes to GHG emission reduction.

The main driving forces for the project proponent have been:
1. To actively participate in the climate change initiative and thereby contribute in the reduction of GHG emissions
2. To contribute towards the sustainable development of the region and promote such technologies in the region.

In spite of the fact that use of rice husk as fuel was not the most cost effective solution, it was considered that some benefits for the activity could be taken via

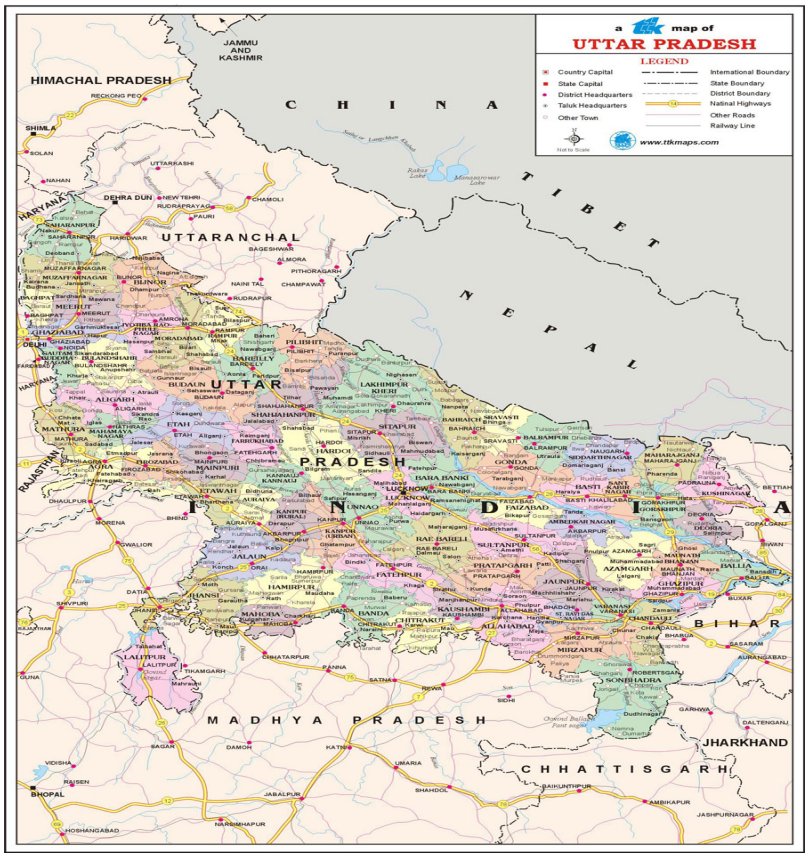
different GHG mitigation programs to offset the investment barriers associated with the use of rice husk as a fuel for operating the process steam boiler. The rice husk fired boiler was not cost effective option in comparison to a coal based boiler mainly due to the increase in capital cost. Apart from this, large storage space for rice husk storage as the availability of rice husk is seasonal and increased labour requirement (both skilled as well as unskilled) adds operating cost of a rice husk boiler.

Accordingly, the rice husk fired boilers were procured from M/s Cheema Boilers Limited.

1.5 Project location including geographic and physical information allowing the unique identification and delineation of the specific extent of the project:

SAEL facility is located at Village Fatehullapur, district Ghazipur, Uttar Pradesh, India. The project site is located on Varanasi-Gorakhpur highway and is about 60 Km away from Varanasi. The plant is about 10 km away from Ghazipur railway station. Nearest airport is Babatpur in district Varanasi which is about 65 km away. The coordinates of Ghazipur are:
Latitude – between 25° 19' and 25° 54' North
Longitude – between 83° 4' and 83° 58' East

The map depicting the location of the project activity is provided below;


a map of
UTTAR PRADESH
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Country Capital
State Capital
District Headquarters
Taluk Headquarters
Other Town
International Boundary
State Boundary
District Boundary
National Highways
Other Roads
Railway Line
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JHARKHAND
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M A D H Y A P R A D E S H
DELHI
SHIMLA
DEHRA DUN
LUCKNOW
BHOPAL


Ghosi
Azamgarh
Mubarakpur
Shahganj
Sarai Mir
Nizamabad
Muhammadabad
Kopagani
Mau
Jaunpur
Machhlishahr
Sadat
Mariahu
Ghazipur
Muhammadabad
Saidpur
Ghazipur
Ianka
Reotipur
Surianwan
Baragaon
Zamania
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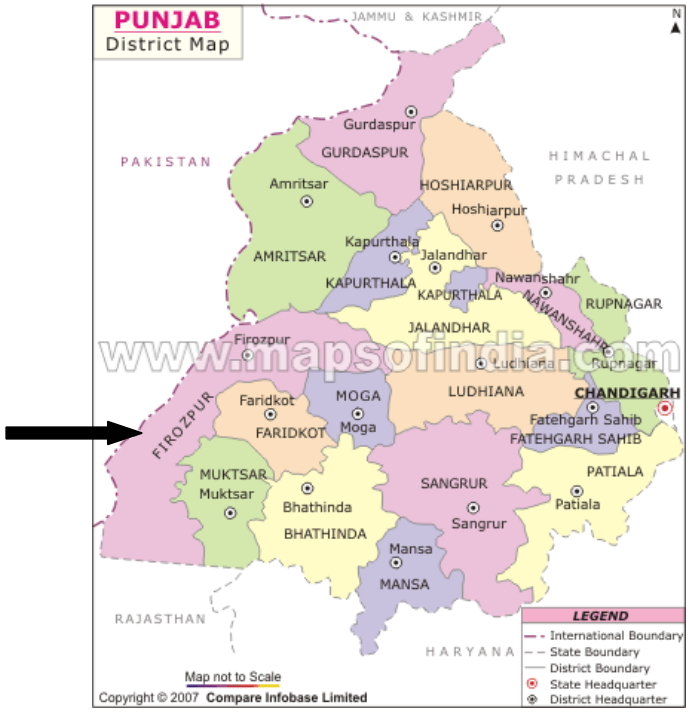
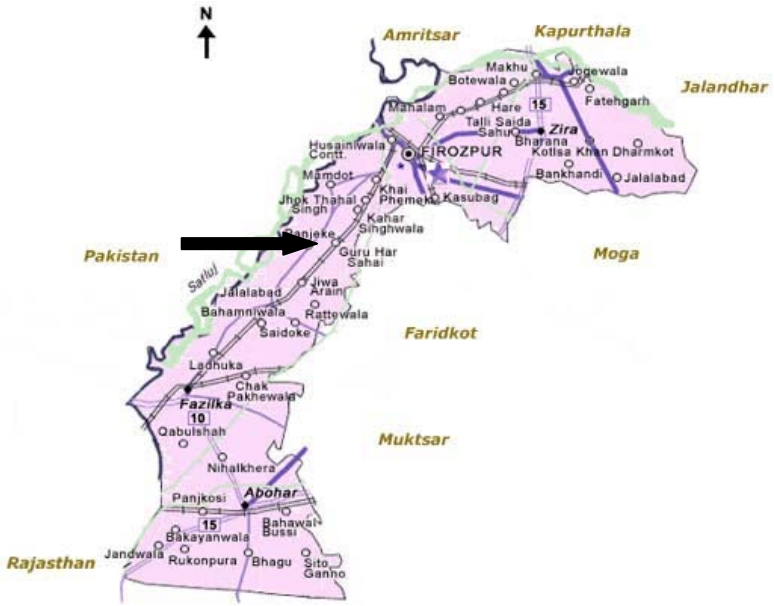
Gyanpur
Varanasi
Mughal Sarai
Chandauli
Kachhwa
Mirzapur
Chunar
Chakia
Ahraura
Bhabua
20 mi
20 km
Map data ©2009 AND, Europa Te

Physical address of the project activity-
M/s Sukhbir Agro Energy Limited
Village Fatehullapur, District Ghazipur,
Uttar Pradesh – 233302

SRS facility is located at Guru Har Sahai, Faridkot Road in the District of Ferozpur in the state of Punjab, India. Guru Har Sahai is located approximately at the co-ordinates 30° 43' 0" North, 74° 25' 0" East[3] and is well connected to the other places in the state. The nearest railway station is the Guru Har Sahai railway station on the Ferozpur – Jalalabad road. Guru Har Sahai is about 350 km north of Delhi. The map depicting the location of the project activity is provided below;

[3] http://www.maplandia.com/india/punjab/firozpur/guru-har-sahai/





Physical address of the project activity-
M/s Sri Ram Solvex
Guru Har Sahai, Faridkot Road,
Distt. Ferozpur (Punjab) – 152022

1.6 Duration of the project activity/crediting period:

As per the policy announcement from the VCS Association on 10th September 2008, the project start date is revised as "the date the project activity began reducing or removing GHG emissions". The Shri Ram Solvex 3 TPH boiler was commissioned on 30/08/2007 and the Sukhbir Agro Energy Limited 10 TPH boiler was commissioned on 26/11/2007. Thus the start date of the project activity is taken to be 30/08/2007. The operational life time of the project activity is 25 years.

As per the VCS 2007.1 guidelines the earliest crediting period start date would be 28th March 2006. Since the start date of the project activity is after 28th March 2006, the VCS project crediting period would start from 30/08/2007. The VCS project crediting period would be 10 years from the start date of project activity and shall be renewed once.

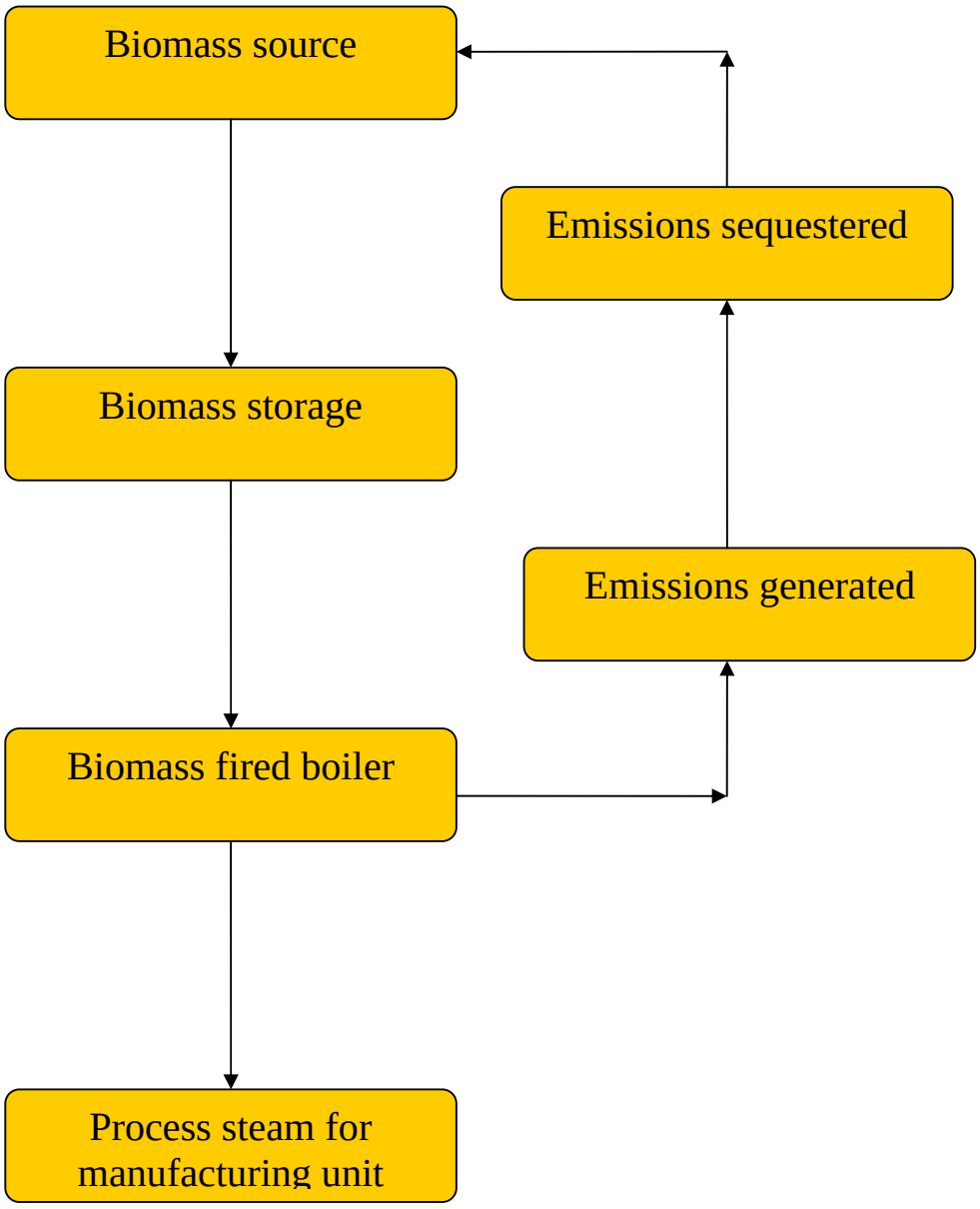
1.7 Conditions prior to project initiation:

Since the project activity is a Greenfield project, prior to the project there was no requirement of heat at site and hence no source of heat was available at site.

To meet the process steam requirements it was proposed to install an in-house boiler. It was observed that, in the nearby industrial area mostly the process steam generation was carried out by using coal. In spite of the relatively better understanding of the standard prevalent practices of meeting thermal energy requirements of process industries through use of fossil fuels; the concern about the negative impact of use of fossil fuels made the project proponents decide to install rice husk based boilers. Hence to contribute voluntarily in mitigation of Green House Gases (GHG) and also having concerns towards sustainable development, the management decided to consider greener and environment friendly means of meeting its process steam requirements.

1.8 A description of how the project will achieve GHG emission reductions and/or removal enhancements:

The project activity is based on renewable biomass fuel (rice-husk) which is GHG neutral. The project activity replaces the use of fossil fuel for steam generation.



The project activity is carbon neutral as CO_2 generated during combustion of fuel is taken up by the biomass for its growth as shown in the above diagram. The technology used in the project activity is indigenous and safe. Since the project activity utilizes biomass as fuel, it helps in conservation of natural resources such as coal, natural gas etc.

Combustion of coal in the baseline scenario for meeting the process steam requirements would have led to the emission of carbon dioxide which is a GHG. With the implementation of the proposed project activity, the overall emission of carbon dioxide to the atmosphere is almost zero. Hence by reducing the dependence on fossil fuel and not emitting CO_2 the implementation of project activity will achieve net GHG emission reduction.

1.9 Project technologies, products, services and the expected level of activity:

The project activity comprises use of rice husk fired boilers for generation of process steam. The technology being used for generation of steam is the fluidized bed combustion (FBC) of rice husk in the boiler. The FBC technology is proven, indigenous and safe.

Rice husk has got very specific characteristic due to which it burns in two stages. During first stage of combustion volatile gas extraction takes place, which occur instantly after feeding. During second stage of combustion; burning of carbon takes place. In case of rice husk conventional firing method cannot be used if complete combustion is required. The combustion of rice husk in conventional method leads to very high burnt combustibles. This is mainly because of the nature of the fuel. The rice husk fired fluidized bed boilers offer advantages like excellent combustion, quick start-up, low pollution and simple operation and maintenance. Compared to a boiler efficiency of 55-60% achievable with stepped grate furnace, the fluidized bed combustion technology will give a high efficiency of the order of 75-80%.[4] Fluidized Bed Combustion is considered as the best among all presently available technology options for combustion of rice husk. The term "fluidized bed combustor" (FBC) encompasses a range of combustion/boiler combinations where combustion of the fuel takes place within a bed of inert material that is kept in a fluidized state by an upward draught of air. The combustion chamber is similar to conventional boilers, such as stoker fired designs, except that the floor of the boiler is covered with numerous air nozzles and some ash removal outlets. Primary combustion air enters the boiler through the nozzles and in so doing causes the mix of fuel and inert material to mix continuously in a manner similar to a fluid. The fuel is often fed from apertures located some distance above the bed. Depending on the ash content of the fuel, additional inert material may also be introduced to ensure that sufficient bed inventory exists for stable fluidization. The mixing caused by fluidization produces a relatively uniform combustion temperature and avoids the extremes in temperature that occur in other types of combustion.

Some of the characteristics of such fluidized bed boilers include

- Ability to burn low-grade biomass fuels, due to the high thermal inertia and high turbulence of the fluidized bed
- High combustion efficiency, due to the turbulent mixing of the fluidized bed and the long residence time of the fuel in the furnace.

The technical parameters of the husk fired boilers are listed in the table below:

Sukhbir Agro Energy Limited	
Boiler pressure rating	17. 5 kg/cm^2

[4] http://www.iges.or.jp/APEIS/RISPO/inventory/db/pdf/0004.pdf

Boiler steam generation rate (capacity)	10 tons/hour
Steam generation rate (average @ 80% PLF)	8 tons/hour
No. of operating hours a day	24
Type of boiler	water tube type
Fuel used	Rice husk
Method of firing of fuel	Furnace
Calorific value of the fuel	3100 kcal/kg

Sri Ram Solvex	
Boiler pressure rating	10. 54 kg/cm^2
Boiler steam generation rate (capacity)	3 tons/hour
Steam generation rate (average @ 80% PLF)	2.4 tons/hour
No. of operating hours a day	24
Type of boiler	water tube type
Fuel used	Rice husk
Method of firing of fuel	Furnace
Calorific value of the fuel	3200 kcal/kg

1.10 Compliance with relevant local laws and regulations related to the project:

The project activity comprises of establishment of rice husk fired boiler and use of rice husk as fuel for meeting the process steam requirements of the production unit. As such there is no restriction in the country regarding the choice of fuel for process steam generation. However, the production units are required to comply with the local restrictions regarding the emissions due to the operation of the boilers/furnaces. Further to this establishment of the boilers and their operation require approval from the Inspectorate of boiler, Department of Boiler, State Government. The project proponent has obtained the NOC from the State Pollution Control Board and the local Inspectorate of Boiler to operate the husk fired boiler in the region. The project thus fully complies with the local laws and regulations.

1.11 Identification of risks that may substantially affect the project's GHG emission reductions or removal enhancements:

No major risks have been perceived with the project activity as of now. However the only minor risk that is anticipated is associated with the breakdown of boiler. There is a possibility that the boiler may break down temporarily because of a technical snag. In the event of the same the GHG emission

reductions will be reduced. In such an event the technical snag in the boiler will be rectified at the earliest to resume operations.

1.12 Demonstration to confirm that the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.

The rice husk fired boiler is installed to meet the process steam requirements in the manufacturing unit. Rice husk is a carbon neutral fuel. The CO_2 emissions due to the combustion of rice husk are neutralized by the photosynthesis process of paddy crops. Hence, it recycles atmospheric CO_2 released during combustion and does not add to the green house effect. In the absence of the project activity the project proponent would have used coal to generate steam to meet the process requirement. Thereby it is confirmed that the project is not implemented to create GHG emissions primarily for the purpose of its subsequent removal.

1.13 Demonstration that the project has not created another form of environmental credit (for example renewable energy certificates).

Any such scheme like renewable energy credit etc. is not currently available in the country. It is confirmed that the project has not created any other form of environmental credits under other GHG programs.

1.14 Project rejected under other GHG programs (if applicable):

As mentioned in section 1.13, the project has not been proposed under any other environmental credit / GHG programs. Hence this case is not applicable.

1.15 Project proponents roles and responsibilities, including contact information of the project proponent, other project participants:

Sukhbir Agro Energy Ltd. is the project owner and the project participant. Sri Ram Solvex has authorised SAEL to be the project participant on their behalf also. Apart from the project proponents there are no other project participants for the time being. The contact details of the project participant is given in below:

Organization:	Sukhbir Agro Energy Ltd.
Street/P.O.Box:	Village: Fatehullahpur, Varanasi Gorakhpur Highway
Building:	-
City:	Ghazipur,
State/Region:	UP
Postfix/ZIP:	233302
Country:	India
Telephone:	0542-3206987

FAX:	-
E-Mail:	ghazipur@sukhbiragroenergy.com, biomass@sukhbiragroenergy.com
URL:	-
Represented by:	
Title:	General Manager
Salutation:	Mr.
Last Name:	Arora
Middle Name:	L
First Name:	M
Department:	-
Mobile:	+91 9936411882
Direct FAX:	+91 1685 232282
Direct tel:	+91 9453002501
Personal E-Mail:	gm@sukhbiragroenergy.com

Both the project proponents will individually operate, maintain and monitor their projects. However all the communication related to the VCS project with the VCS Board and the Validator will be done by Sukhbir Agro Energy Limited, the project participant.

1.16 Any information relevant for the eligibility of the project and quantification of emission reductions or removal enhancements, including legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and temporal information.):

Sustainable Development by the project activity

The project activity will contribute towards the Government of India's sustainable development criteria in the following manner:

1. The project activity will lead to overall development of the region, and will improve the socio-economic status of rural people residing nearby the manufacturing unit. The use of biomass will provide an additional source of income for the rural community. Rice husk handling will also generate employment for the local people including both skilled as well as unskilled labour.
2. This will provide necessary impetus for industries to come up with more such projects in the area and set up an example for other industrial units to come up with more such green field projects.
3. Since the project activity utilizes biomass as fuel, it will reduce the dependence on non renewable sources of energy such as coal, oil etc.
4. The project activity is carbon neutral as the emissions generated and sequestered balance each other so the net emissions of the cyclic process are nil.
5. The technology used in the project activity is indigenous and safe.

The detailed explanation of the above mentioned points is as under

Social well being

The proposed project activity will lead to generation of employment and development in the local region. More prominently employment is generated amongst the local contractors, laborers and others for biomass handling at the project site. This is in addition to the employment generated as a result of the operations and commissioning of the unit. Thus the implementation of the project activity is expected to contribute to the provision of basic amenities to the local region, which is relatively backward and under-developed.

Economic well being

The proposed project activity will lead to economic development in the region at the micro-level by facilitating alleviation of poverty amongst local people. At the macro-level, the project activity aids to sustainable development by substitution of fossil fuels by renewable biomass. This reduces the country's reliance on fossil fuels, majority of which is imported and provides economic value to crop residues, which previously had no commercial value.

Environmental well being

The project activity will result in GHG emission reduction by utilising biomass residues as fuel and avoiding use of displacing fossil fuel. In addition to the reduction in carbon dioxide (CO2) emissions the project implementation will avoid the emission of other harmful gases (NOx and SOx) that arise from the combustion of coal used in heat generation. The project will also lead to reduced ash generation since the ash content in rice husk is lower than that of Indian coal.

Technological well being

The proposed project activity under consideration uses greener technology, which promotes sustainable development. While the project showcases an innovative way for energy utilization of biomass (rice husk) which are not normally used for heat generation purposes. The emphasis on using renewable biomass as the fuel firmly sets an example for implementing technological processes that help mitigate the green house gas emissions. The initiative is also in line with the global focus towards sustainable development.

1.17 List of commercially sensitive information (if applicable):

NA

2 VCS Methodology:

2.1 Title and reference of the VCS methodology applied to the project activity and explanation of methodology choices:

The VCS program approves the use of "Clean Development Mechanism" (CDM) methodologies framed by CDM EB, UNFCCC. Accordingly, the project activity in this case uses one of the CDM baseline and monitoring methodologies.

The methodology used for the project activity is AMS I C – "Thermal Energy for the user, with or without electricity" Version 13[5]: approved during 38th meeting of the CDM Executive Board i.e. EB-38.

2.2 Justification of the choice of the methodology and why it is applicable to the project activity:

The category I C comprises renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuels. Examples include solar water heaters and solar dryers, renewable biomass for water heating, space heating or drying and other technologies that provide thermal energy that displaces fossil fuel. The project activity is a renewable biomass based thermal energy generation project. The project activity entails installation of a biomass fired boiler to meet the process steam requirements. Thereby the primary applicability of the category I C is suitably justified. The detailed justification on applicability of the methodology to the project activity is provided below.

Justification of applicability of the methodology

1. 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 is use of biomass in boiler to meet the process heat requirement by avoiding the use of fossil fuel in boiler. Hence this satisfies the first applicability condition of the methodology.

2. Where thermal generation capacity is specified by the manufacturer. It shall be less than 45 MW_{th}.

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

Under the project activity two boilers of 10 TPH and 3 TPH capacity each generating saturated steam at a pressure rating of 17.5 kg/cm2 and 10.54 kg/cm2 respectively are installed. The combined thermal energy production capacity of the boilers is 10.09 MW thermal (less than 45 MWthermal). As 10.09 MWth is less than 45 MWth, it qualifies the project as a small scale activity as per the condition given in the methodology.

Boiler Capacity	TPH	10	3
Pressure	kg/cm2	17.5	10.54
Steam Enthalpy	kJ/kg	2796.65	2782.41
Thermal Output	MWthermal	7.77	2.32

3. For Co- fired systems the aggregate installed capacity(Specific for fossil fuel use) of all the 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(eg. 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 ie 45 MWth.

This case is not relevant to the project activity as the aim of the project activity is to use only biomass residue as fuel in the project activity and no other fossil fuel will be used.

4. In the case of the project activity that involves the addition of renewable energy unit at an existing renewable 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 above mentioned case is not relevant to the project activity as the project activity is the first ever installation of renewable energy facility in the plant.

It can be concluded from the above mentioned points that the project activity satisfies all the applicability conditions of the methodology and hence this methodology is applicable in context with the project activity.

2.3 Identifying GHG sources, sinks and reservoirs for the baseline scenario and for the project:

In line with the rules and procedures for Type IC small scale projects, “The physical, geographical site of the renewable energy generating delineates the boundary”. The boundary therefore encompasses the boiler and the unit which utilizes the heat generated from this source. In terms of gases, the project boundary is restricted to CO2 reduction.

The source of GHG encompasses combustion of biomass which can be categorised as:-

On-Site Emissions

Under the baseline the GHG (CO_2) emissions arise from combustion of coal. The emissions after implementation of the project arise from the combustion of biomass in the boiler and mainly include CO_2. However, the CO_2 released is very less as compared to amount of CO_2 taken up by the biomass during growing. Therefore no net emission occurs in the atmosphere.

Off-Site Emissions
These types of emissions in the proposed project arise from the biomass transport. These emissions will also occur during transportation of coal from coal mine to site. Hence the off-site project emissions have not been taken into consideration.

2.4 Description of how the baseline scenario is identified and description of the identified baseline scenario:

The baseline scenario in the context of the present project activity is an alternative to the generation of steam using rice husk fired boiler which the project proponent considered while looking at the prevailing practise. In the absence of the VER project activity, the project proponents would have installed a coal based boiler to meet the captive heat demand. So in the absence of project activity there will be continued consumption of coal which would have led to green house gas emissions as compared to the proposed project activity.

Thus, the baseline scenario to the project activity is consumption of coal for meeting the captive heat demand of the textile unit.

As per paragraph 6 of the small scale methodology AMS IC ver 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 same has been chosen as the baseline for the project activity. The emission coefficient has been chosen from the Initial National Communication to UNFCCC by India.

2.5 Description of how the emissions of GHG by source in baseline scenario are reduced below those that would have occurred in the absence of the project activity (assessment and demonstration of additionality):

Additionality is determined by using Test 1 – The project test as per the VCS program

Step 1: Regulatory Surplus
The proposed project activity is not mandated by any enforced law, statute or other regulatory framework. Entities in India are not enforced under any law to generate steam and electricity from biomass fuels for captive consumption.

Step 2: Implementation Barriers

Barriers faced by the project activity

The demonstration of additionality focuses on the barriers faced by the project. In showing that the project is additional we demonstrate that it is not part of the baseline scenario, which in the case of the project proponents would be the use of coal for steam generation. The project activity has to overcome technical and investment barriers for its successful implementation.

Barriers faced by the Project Activity

Investment Barrier:

One of the major barriers associated with the project activity is the investment barrier. Considering the option available of installing a coal based boiler, the project proponent has chosen a more expensive option of installing a rice husk based boiler.

This is demonstrated by estimating the levelized cost of generation of steam form both coal based and rice husk based boilers i.e. for comparative analysis of the project activity vis a vis the baseline scenario unit cost of energy is taken as the indicator. The table below provides the unit cost of energy for the project case, baseline scenario, which is generation of heat energy from coal fired system and another option of furnace oil based steam generation:

Sukhbir Agro Energy Ltd.				
Particulars	**Unit**	**Coal**	**Furnace Oil**	**Biomass**
Steam Generation	T/yr	63,360.00	63,360.00	63,360.00
Calorific Value (1)	kCal/kg	4,200.00	9650.00	3,100.00
Boiler Efficiency (2)	%	82	88	80
Quantity Used	T/yr	12,291.10	4,984.76	17,068.78
Cost of Fuel (3)	Rs/T	3,000.00	14,015.00	2,500.00
Total Fuel Cost	mn. Rs	36.87	69.86	42.67
Unit Cost of Steam	Rs/kg	0.58	1.10	0.67

Sri Ram Solvex				
Particulars	**Unit**	**Coal**	**Furnace Oil**	**Biomass**
Steam Generation	T/yr	19,008.00	19,008.00	19,008.00
Calorific Value	kCal/kg	4,200.00	9650.00	3,200.00
Boiler Efficiency	%	82	88	81
Quantity Used	T/yr	3,668.56	1,487.81	4,874.42
Cost of Fuel	Rs/T	3,700.00	14,015.00	3,200.00
Total Fuel Cost	mn. Rs	13.57	20.85	15.60
Unit Cost of Steam	Rs/kg	0.71	1.10	0.82

The unit cost of steam generation is calculated on the basis of heat value (enthalpy) of steam generated[6], calorific value of fuels used[7], boiler efficiency

[6] The heat value (Enthalpy) of steam has been estimated from SPIRAX website using the design pressure and temperature values of the boiler

levels[8] and cost of fuels[9] used. The table demonstrates that the cost of steam generation from the rice husk is higher than using coal, while the cost is highest for furnace oil. It is evident that use of furnace oil for steam generation is not a viable option. It was a voluntary decision for the project proponents to take, instead of the fact that the coal based heat generation is economical and prevalent. The project proponents had the option to either use biomass or coal once they decided to install a boiler. The capital cost (investment) is same for either biomass or coal. The operating non-fuel costs is exactly the same whether on biomass or on coal. In such a scenario, the only determinant from the perspective of analysis is the fuel cost (on a INR/GCal basis) for using coal or biomass.

Thus it is concluded that coal based heat energy generation is a more viable alternative to the project and this would lead to higher emissions as compared to the project activity.

Technological Barrier:

Fuel Characteristics

The characteristics of rice husk - the low density and high volume crop residue being used in the project activity imply a series of technological innovations to be carried out, as compared to standard design of conventional coal fired boilers. The range of innovations to be carried out, among others, include an innovative boiler design, anti-corrosive piping, improved fuel management and boiler operation. The efficiency difference would affect the fuel consumption rate in the system and hence it would cost more for the same amount of energy generation. The ash generated after combustion of rice husk contains high percentage of silica which leads to rapid erosion the equipments. Due to high silica content equipments like ID fan and top portion of the stack get eroded which leads to high maintenance cost. Presence of silica in rice husk ash also corrodes boiler tubes which require frequent maintenance of the boiler. Further, in rice husk fired boiler, escape of fluidized media along with flue gas is a common problem. To compensate this and to maintain fluidized bed thickness, fluidizing media is required to be added at regular intervals. This leads to variation in the air requirements. In a nutshell the operation and control of biomass fired boiler requires skilled boiler operators.

Project owners of this project activity have ventured first time into such an activity and have no prior experience. Apart from the enhanced cost of steam generation as compared to the baseline option of using coal, their inexperience in this field may be barrier & pose difficulties in its operation and maintenance.

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[7] The calorific value of - rice husk has been used form the technical specification/design basis as provided by boiler manufacturer, coal has been used as the average value mentioned in the quotation from coal supplier & furnace oil has been used from the document available on Petroleum Conservation Research Association website.

[8] The efficiency of - rice husk boiler has been taken from the technical specification/design basis as provided by boiler manufacturer and coal & furnace oil boiler has been used from the database of boiler manufactures available on the web.

[9] The cost of - rice husk & coal has been used from the quotations of suppliers and furnace oil has been used from the values of National Commodity & Derivatives Exchange Ltd.

Carbon credit benefits through the VCS route would compensate these potential losses and will support the project activity financially and to some extent cover the risks involved.

Step 3: Common Practice

Rice husk based steam generation is not a common practice in the region of project activity in Ghazipur. In fact the project activity is the first rice husk based boiler in the region. This is evident from the certificate received from the district industry centre. A copy of the same will be provided to the validator

The rice husk based boiler installed in Guru Har Sahai is one of its kind installed in the region. It is the only boiler in the region to be installed with a heat recovery unit, an air pre-heater. This is certified by the letter from the Rice Millers Association.

Based on the above analysis, it is concluded that the project activity is not a common practice in their respective regions.

3 Monitoring:

3.1 Title and reference of the VCS methodology (which includes the monitoring requirements) applied to the project activity and explanation of methodology choices:

The VCS program approves the use of methodologies for "Clean Development Mechanism"(CDM) approved by the CDM Executive Board (CDM EB). Accordingly the project activity in this case uses one of the baseline and monitoring methodologies approved by the CDM EB.

The methodology being used in this case is AMS 1 C – "Thermal Energy for the user, with or without electricity" Version 13; approved during 38th meeting of the CDM Executive Board i.e. EB 38.

In accordance with the applicable baseline methodology the corresponding monitoring methodology AMS 1C will be used for the proposed project activity.

3.2 Monitoring, including estimation, modelling, measurement or calculation approaches:

In accordance with the guidelines laid down in the applicable methodology, "AMS IC, monitoring shall consist of;

- Metering the energy produced by a sample of the systems where simplified baseline is based on the energy produced multiplied by the emission coefficient.
- Metering the thermal and electrical energy generated for the co-generation projects (not applicable in the proposed project).

The methodology also states that "for projects where only biomass or biomass and fossil fuel are used the amount of biomass and fossil fuel input shall be monitored."

The efficiency of baseline units considered in accordance with the provisions in the approved methodology AMS IC , Version 13 is determined using the guidelines in para 13.
Criteria 2 has been considered which mentions "Highest of the two values provided by two manufacturers for units with similar specifications"

$BE_y = H_y * EF / \eta$

Where;

BE_y = Baseline emissions of GHG from steam/heat displaced by the project activity during the year y in tCO_2e.

H_y = Net quantity of heat supplied by the project activity in the form of steam during the year y in TJ.

EF = Emission factor per unit of energy of fuel that would have been used in the baseline plant in (tCO_2 / TJ)

η = Efficiency of the boiler using fossil fuel is chosen as highest of the two values provided by two or more manufacturers for units with similar specifications that would have been used in the absence of the project activity

$$Hy = Q_Y * H_S$$

Where;

Q_Y = Quantity of steam supplied by the project activity during the year y in Tons.

H_S = Average enthalpy of the steam generated during the year y in TJ / Ton

For determining the enthalpy of steam, pressure of the steam will be monitored. Value of enthalpy will be determined using steam tables.

Accordingly the parameters being monitored in case of the proposed project activity include the quantum of process steam generated, quantity of rice husk used and pressure of steam generated. Since the fossil fuel is not used even during start up, monitoring of fossil fuel has not been considered. Start up of the boiler is done using old jute bags, that are available at site and do not create any GHG emissions.

At the time of estimating the emission reductions following approach will be used[10]:
"The amount of thermal energy or electricity generated using biomass fuels calculated as per paragraph 21 shall be compared with the amount of thermal energy or electricity generated calculated using specific fuel consumption and amount of each type of biomass fuel used. The lower of the two values should be used to calculate emission reductions".

The specific fuel consumption used currently has been mentioned in section 3.3.

3.3 Data and parameters monitored / Selecting relevant GHG sources, sinks and reservoirs for monitoring or estimating GHG emissions and removals:

Data / Parameter:	**Q_Y = Steam generated in the husk fired boiler during the period Y**
Data unit:	Tons
Description:	Quantum of Saturated steam generated in the husk fired boiler in a year
Source of data to be used:	Steam flow meter installed at the outlet of the boiler
Value of data	Will vary and will be obtained during monitoring.

[10] As per the methodology AMS 1C point 23

	However for emissions reduction estimation purpose following values have been used: 10 TPH Boiler – 63360 Tons 3 TPH Boiler – 19008 Tons
Description of measurement methods and procedures to be applied:	Mass flow meter will be used. The flow meter used will be integrator type. The reading at the start of the shift and the end of the shift will be recorded. The difference between the two readings will provide the quantity of steam generated during the shift. The data will be recorded in the log book of the boiler house and will also be stored electronically
QA/QC procedures to be applied:	Calibration of the steam flow meter will be carried out on yearly basis. Correction of meters in case of shift will be done without any delay and the previous readings shall be confirmed with other related parameters such as rice husk consumption.
Any comment:	-

Data / Parameter:	**P_S**
Data unit:	kg / sq. cm
Description:	Pressure of the steam generated in the husk fired boiler
Source of data to be used:	Determined on the online pressure gauge. Average pressure will be taken and entered in the log book of the boiler house. The data will also be stored in electronic from.
Value of data	Will vary and will be obtained during monitoring. However for emissions reduction estimation purpose following values have been used: 10 TPH Boiler – 17.5 kg/sq cm 3 TPH Boiler – 10.54 kg/sq cm
Description of measurement methods and procedures to be applied:	The average value of pressure required to determine the enthalpy will be obtained from the noted value of pressure during the shift.
QA/QC procedures to be applied:	The calibration of pressure gauge will be carried out on yearly basis.
Any comment:	-

Data / Parameter:	**H_S**
Data unit:	kJ / kg
Description:	Enthalpy of saturated steam generated
Source of data to be used:	Determined from the steam tables, using the daily average value of pressure P_S of the steam generated.
Value of data	Will vary and will be obtained during monitoring. However for emissions reduction estimation purpose following values have been used: 10 TPH Boiler – 2796.65 kJ/kg 3 TPH Boiler – 2782.41 kJ/kg
Description of	The average value of pressure required to determine the

measurement methods and procedures to be applied:	enthalpy will be obtained from the noted value of pressure during the shift. The enthalpy will be determined from steam tables
QA/QC procedures to be applied:	The calibration of pressure gauge will be carried out at a frequency of one year. Pressure gauge shall be inspected on daily basis by the operator and any deviation shall be informed and attended for correction by plant incharge.
Any comment:	-

Data / Parameter:	**Efficiency**
Data unit:	Fraction
Description:	Thermal efficiency of the process steam boilers using coal as fuel.
Source of data used:	Technical literature of the manufactures of process steam boilers.
Value applied:	0.82 and is as per criteria 2 of para 13 of AMS IC ver13[11].
Justification of the choice of data or description of measurement methods and procedures actually applied :	In order to compute GHG mitigation due to the proposed project in a conservative manner, the higher limit of designed level of thermal efficiency of the two or more manufacturers has been used. This is as per criteria 2 of para 13 of AMS IC ver 13.
Any comment:	The efficiency levels specified for boilers by the manufactures has been used.

Data / Parameter:	**EF**
Data unit:	kg CO2 / TJ
Description:	Emission factor for coal
Source of data used:	NATCOM – Initial National Communication to UNFCCC 2004
Value applied:	95810
Justification of the choice of data or description of measurement methods and procedures actually applied :	Carbon content of fossil fuels, when specified in terms of calorific value, takes care of any variation in the proximate analysis of the fuel. This is so due to a direct relation between calorific value and carbon content of the fuels.
Any comment:	-

Data / Parameter:	**Quantity of rice husk used during the year y**
Data unit:	Tons
Description:	Quantity of rice husk used per year
Source of data used:	Receipt of rice husk during the year plus the inventory at

[11] Database from boiler manufacturers: Thermax – 82%, Sitson- 80% and Indtex – 78%

	the beginning of the year less the inventory of husk carried forward. The receipt will include the amount of rice husk weighed at the weigh bridge
Value applied:	Will vary and will be obtained during monitoring. However for emissions reduction estimation purpose following values have been used: 10 TPH Boiler – 17068.78 Tons 3 TPH Boiler – 4874.42 Tons
Justification of the choice of data or description of measurement methods and procedures actually applied :	The quantity of rice husk is used during year Y shall be calculated considering prevailing methods of reconciliation. Besides this stock taking of consumption, receipt and stocks shall be maintained to demonstrate transparent process of measurement. The stocks and receipts shall be checked by the accounts section to ensure clarity..
Any comment:	-

Data / Parameter:	**GCV**
Data unit:	kCal/kg
Description:	Gross Calorific value of biomass residue (rice husk)
Source of data to be used:	Measurements
Value applied:	Will vary and will be obtained during monitoring. However for emissions reduction estimation purpose following values have been used: 10 TPH Boiler – 3100 kCal/kg 3 TPH Boiler – 3200 kCal/kg
Justification of the choice of data or description of measurement methods and procedures actually applied :	Measurements shall be carried out at reputed laboratories and according to relevant standard procedure. These procedures are aligned and recognised internationally with best practices. Measure the GCV quarterly.
Any comment:	Measurement of GCV is carried out through standard Indian Standard procedures to ensure consistency of measurement.

Data / Parameter:	**Moisture content of biomass residues**
Data unit:	% Water content
Description:	Moisture content of biomass residue
Source of data to be used:	On-site measurements
Value applied:	Not used in determination of emission reduction, data will be monitored for all the biomass residues used in the project activity scenario
Justification of the choice of data or description of measurement methods and	The moisture content of biomass residue will be determined in the in-house laboratory. Standard testing procedure will be used. The monitoring will be continuously, with mean values calculated annually

procedures actually applied :	
Any comment:	-

Data / Parameter:	Specific Fuel Consumption for rice husk being used as fuel
Data unit:	Dimensionless(Kg of rice husk consumed/Kg of steam produced)
Description:	Specific Fuel Consumption (Annual rice husk consumption/total steam produced)
Source of data used:	The ratio is determined using the calorific value of the rice husk, efficiency of the boiler (as provided by the manufacturer) and enthalpy of steam. The values for the above are obtained from the boiler quotations provided by the vendor and the steam tables. As per AMS I C, para 23 referring to 21- the lowest value is the SFC of rice-husk and the same has been considered for emission reduction calculations.
Value applied:	0.2694 for SAEL Boiler 0.2564 for SRS Boiler
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	This has been calculated ex-ante.

This is described in section 3.2 that fossil fuel is not being used in the project activity and the consent by Pollution Control Board on the application and furnishing of details of fuel proposed indicates emission norms. Since fossil fuel is not used in project activity, monitoring for the same has not been considered. Boiler start-up is done by using old jute bags.

3.4 Description of the monitoring plan

The project activity utilizes renewable source of energy i.e. biomass for reduction of GHG hence proper monitoring of all the GHG performance parameters is must. Therefore project proponent has developed a monitoring plan which will be followed throughout the crediting period so as to ensure proper functioning of the project activity resulting in the generation of carbon credits.
As has been stipulated before, the parameters required to be monitored in the project activity have been indicated in the monitoring plan

These parameters will be monitored and recorded as per indicated frequency in monitoring plan. The source of generation of all these data is the boiler house. Thus all these parameters will be entered in the log book of the boiler house on

per shift basis. In case of pressure the average value will be used. The values of the monitored parameters will also be stored in electronic form.

The responsibility of noting the values of the parameters to be monitored will lie with the shift in-charge of the boiler house. The responsibility for up keeping of the recording and measuring instruments including regular calibration lies with the operation in-charge. The data monitored is stored as paper backup. This data is also transferred to electronic format and archived for a period of 2 years after the crediting period.

4 GHG Emission Reductions:

4.1 Explanation of methodological choice:

In the project activity the mitigation of GHG emissions takes place due to use of a renewable source of energy. In the absence of the project activity coal would have been used for generation of the process steam. Thus in the absence of the project activity the need to generate process steam would have led to GHG emissions. The GHG emissions in the project activity are zero as rice husk is a carbon neutral fuel. In accordance with the provisions in the baseline methodology AMS IC leakages have been considered as zero. Thus, in this case the GHG emission reductions are the GHG emissions in the baseline scenario. Carbon dioxide is considered as the only green house gas in the project baseline.

4.2 Quantifying GHG emissions and/or removals for the baseline scenario:

Based on the expected value of the parameters to be monitored the estimates of the annual baseline emissions of the project activity have been computed as follows:

Sukhbir Agro Energy Ltd.			
	Data / Parameter	**Unit**	**Value**
Q_Y	Expected generation of saturated steam in the husk fired boiler	Tons / Yr.	63360
EF	Default emission factor for coal (NATCOM – India's Initial National Communication to UNFCCC 2004)	Kg CO2 / TJ	95810
P_S	Pressure of saturated steam generated in the husk fired boiler	Kg / Sq. cm	17.5
H_S	Enthalpy of steam generated (SPIRAX Steam Tables - http://www.spiraxsarco.com/resources/steam-tables/saturated-steam.asp)	KJ/Kg of steam	2796.65
η	Efficiency of the fossil fuel based boiler which would have been used in the baseline scenario	Fraction	0.82
BE_y	GHG emissions in the baseline scenario	Tons CO2 / Yr.	20704

Sri Ram Solvex			
	Data / Parameter	**Unit**	**Value**
Q_Y	Expected generation of saturated steam in the husk fired boiler	Tons / Yr.	19008
EF	Default emission factor for coal (NATCOM – India's Initial National Communication to UNFCCC 2004)	Kg CO2 / TJ	95810
P_S	Pressure of saturated steam generated in the husk fired boiler	Kg / Sq. cm	10.54
H_S	Enthalpy of steam generated (SPIRAX Steam Tables - http://www.spiraxsarco.com/resources/steam-	KJ/Kg of steam	2782.41

	tables/saturated-steam.asp)		
η	Efficiency of the fossil fuel based boiler which would have been used in the baseline scenario	Fraction	0.82
BE_y	GHG emissions in the baseline scenario	Tons CO2 / Yr.	6179

4.3 Quantifying GHG emissions and/or removals for the project:

The project activity is renewable energy projects with net zero CO_2 emission due to the carbon sequestration. The rice husk is obtained from paddy crop which is re-grown at the same rate as it is harvested thereby acting as sink for the atmospheric carbon dioxide and the net flux of carbon dioxide to the atmosphere is zero. Since no fossil fuel is used in the project activity, no GHG emissions are anticipated as project emissions.

For the 10 TPH boiler rice husk is available internally from the rice mill. Since the rice mill meets all the rice husk demand of the boiler no leakage is associated with this project in the region.

Rice husk Generation from Rice Mill		
Milling Capacity for Paddy	50	TPH
Operation	4320	180days & 24hrs
Ratio of Rice husk generation to Paddy Processed	20	%
Annual rice husk generation	43200.00	TPA
Requirement of rice husk by boiler	17068.78	TPA

For the 3 TPH boiler surplus rice husk is available in the region of the project. This is demonstrated from the certificate of The Rice Millers Association, which indicates a surplus availability of 33900 TPA of rice husk (paddy husk) in the region. The annual rice husk requirement for the project boiler is 4874.42 TPA. The surplus available rice husk is more than 25% of the project requirement. Thus it satisfies the condition as guidelines indicated as attachment C to appendix B Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories. Hence no leakage is applicable to the project activity.

4.4 Quantifying GHG emission reductions and removal enhancements for the GHG project:

Year	**Emissions in the Project activity (tCO_2)**	**Baseline Emissions (tCO_2)**	**Leakage (tCO_2)**	**Emission Reductions (tCO_2)**

30 –Aug-2007 to 29-Aug 2008	0	26,883	0	26,883
30 –Aug-2008 to 29-Aug 2009	0	26,883	0	26,883
30 –Aug-2009 to 29-Aug 2010	0	26,883	0	26,883
30 –Aug-2010 to 29-Aug 2011	0	26,883	0	26,883
30 –Aug-2011 to 29-Aug 2012	0	26,883	0	26,883
30 –Aug-2012 to 29-Aug 2013	0	26,883	0	26,883
30 –Aug-2013 to 29-Aug 2014	0	26,883	0	26,883
30 –Aug-2014 to 29-Aug 2015	0	26,883	0	26,883
30 –Aug-2015 to 29-Aug 2016	0	26,883	0	26,883
30 –Aug-2016 to 29-Aug 2017	0	26,883	0	26,883
Total Emission Reductions (tCO_2) of ten years				268,830
Average emission reduction per year (tCO_2)				26,883

5 Environmental Impact:

There are negligible environmental impacts of the project activity and the project proponent has taken all precautionary and remedial measures to mitigate the impacts during the operational stage. Instead there are positive environmental impacts of the activity such as avoidance of the emission of CO_2, NO_x, SO_x etc. Also the amount of ash generated decreases significantly as the ash content of rice husk is low as compared to the conventional coal. The project proponents have installed air pollution control equipments (TREMA Cyclone) in their boilers to control the emission of particulate matter under the statutory limits. Ash is manually collected from boiler sections in the trolley. As a goodwill gesture the farmers are given the ash to use as manure in their fields.

The project proponent has obtained the required permissions from the concerned authorities. The project activity substitutes the use of non renewable fuels with renewable fuels, thus conserving precious natural resources for the country and reducing net GHG emissions to the atmosphere. There are no significant environmental impacts due to the project activity.

The environment and safety aspects that are taken care by project activity are discussed as follows:

- The project activity follows the norms set up by the State Pollution Control Board.
- It maintains and operates the pollution control devices as per the norms prescribed in Environment Protection Rules 1986, Water (Prevention and Control of Pollution) Act 1974 and Air (Prevention and Control of Pollution) Act.

6 Stakeholders comments:

The stakeholders meetings were conducted on 27th March 2008 for 3 TPH boiler at M/s Sri Ram Solvex and on 15th September 2008 for 10 TPH boiler at M/S Sukhbir Agro Energy Limited. The meeting was organized in the boundary of the project activity inviting all those who would be affected directly or indirectly by the implementation of the project activity.

The stakeholders were invited by distributing pamphlets in the nearby areas. In the meeting conducted the stakeholders were explained the basis of climate change and its mitigation of emissions. The stakeholders were made aware about the greenhouse gases, their impact on the environment and the efforts required being undertaken to reduce the emission of such gases. It was further explained that all legal and statutory requirements were completed prior to the project activity. The entire procedure of procurement of biomass to reduction in the gases in the surrounding areas was satisfactorily described to the people. The queries put by the people were answered to their contentment by the project proponents.

The overall response to the project, from local stakeholders, was encouraging and positive. Overall there was no significant negative comment by any of the stake holders.

7 Schedule:

Sr.	Particulars	Day	Month	Year
1	PO raised for the husk fired boiler on Cheema Boilers Ltd For 10 TPH boiler	03	Feb	2007
2	PO raised for the husk fired boiler on Cheema Boilers Ltd For 3 TPH boiler	07	May	2007
3	Permission for Erection/Installation of the 10 TPH husk fired boiler from the Deputy Chief Inspector of Boilers	26	November	2007
4	Permission for Erection/Installation of the 10 TPH husk fired boiler from the Deputy Chief Inspector of Boilers	30	August	2007
5	Grant of "Consent to Operate", for the manufacturing facility M/s Sri Ram Solvex from Punjab Pollution Control Board	18	March	2009
5	Appointment of Green Positive as Consultants for the VER project development	7	May	2008
6	Appointment of DOE	17	September	2008

8 Ownership:

8.1 Proof of Title:

The title of ownership is demonstrated by the purchase order placed by PP to the boiler supplier (M/s Cheema Boilers Ltd.).

8.2 Projects that reduce GHG emissions from activities that participate in an emissions trading program (if applicable):

NA