CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

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LHSF RE Project
12/01/2011
Version 16

A.2. Description of the project activity:

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The project activity (a power and heat plant[1]) is undertaken by LH Sugar Factories (LHSF) Ltd adjacent to their sugar factory located in Pilibhit, Uttar Pradesh, India and involves the installation of a new power plant, next to an existing power plant.

Purpose of project activity
The power plant will use bagasse, a biomass residue material that is produced from the milling of cane, and the electricity generated will be supplied to the grid thus reducing emissions. The proposed CDM project - increasing power generation at the plant, leading to exports of power to the grid will therefore supplement current and planned electricity generation from traditional fossil fuel based grid power plants.

The existing configuration of the power plant, boilers and turbine generators, is shown in the following table. This configuration was sufficient to supply electricity to the adjacent sugar factory and also export a small amount of electricity to the grid (the existing supply to the grid was undertaken with CDM benefits). The 80 TPH boiler and the 12 MW turbine generator are part of the existing small scale registered CDM project, project number 0334, "LHSF Bagasse Project".

	Capacity	Operating pressure kg/cm^2	Operating temperature ^oC	Manufacturer	Type
Boilers	45TPH	45	440	WIL	Bagasse fired
	45TPH	21	340	Thermax	Bagasse fired
	20TPH	21	340	Lipi	Bagasse fired
	80TPH	67	485	Walchandnagar Ind.	Bagasse fired
Turbines	3MW	45	440	Triveni	Back pressure
	2.5MW	21	325	APE Bellis	Back pressure
	1.5MW	21	325	BHEL	Back pressure
	12MW	65	510	Triveni	Back pressure

The implementation of the project activity will result in the addition to the existing configuration of a 120 tph Sitson high pressure boiler and a 26.75MW extraction cum condensing turbine generator manufactured by Triveni.

[1] The project activity is a power and heat plant as evidenced from the type of turbine installed – an extraction cum condensing turbine.

	Capacity	Operating pressure kg/cm^2	Operating temperature ^oC	Manufacturer	Type
Boiler	120TPH	67	510	Sitson	Bagasse fired,water tube
Turbine	26.75MW	65	510	Triveni	Extraction-condensing.

The project activity involves the above mentioned installation of a high pressure boiler and turbine generator. After the implementation of the project activity the boilers of capacity 45 TPH and pressure 21kg/cm^2 and 20 TPH and the turbine generators of 2.5 MW and 1.5 MW capacity could continue to operate but are retired due to the installation of new biomass residue fired power and heat plant. The project activity will have an export capacity of 21.78MW during the season and 24.08MW in the off-season[2] of electricity which will be supplied to the grid via Roopurkamlu substation of UPPCL which is located at a distance of 5km from the plant.

The baseline scenario is the same as the scenario prior to the implementation of the project activity.

Explanation of how the project activity reduces greenhouse gas emissions
The project activity will result in electricity exports to the grid. The grid to which the project activity is connected is predominantly fossil fuel based and therefore the electricity will supplement and replace existing grid based generation, thus reducing greenhouse gases from these sources. The gases considered in the calculation of the emission reductions are carbon dioxide.

Sustainable development
The project will contribute to sustainable development not just directly through an increase in employment in the new power and heat plant but also indirectly in terms of the benefits it will provide to the local community in the form of increased electricity availability and security of employment.

The adjacent sugar factory is rurally based and provides an important source of employment for the local community. This is an important factor given that over 70% of India's population is based in rural areas. The factory is the major industry in the area, employing about 670 people in season and 300 people in off-season. and receives sugar cane from over 60,000 farmers many of whom cultivate on less than 1 acre.

The indirect benefits of the project are twofold. Firstly, the project will allow for the diversification of the revenue of the sugar factory through the sales of electricity and CERs, and thus the project will assist in establishing the viability of the unit. This will contribute to the continuation and furthering of the benefits the factory's presently provides to the local economy. The factory currently provides seed at no up-front cost, and insecticides and pesticides at 50% of their cost, to farmers, deducting the cost from the cane price (with no interest charged). The extension work of the factory extends to the provision of loans for tube-wells, bullock carts and plant protection loans. Secondly, by producing clean and renewable power, the project activity will contribute to electricity security and lead to the displacement of fossil fuel based generation.

The combustion of renewable biomass has long term benefits related to climate change given that the alternative is a fossil fuel based generation system. Local pollution will also be reduced through the

[2] From the supply order of the turbine 24.2MW will be generated in the season and 26.75MW in the offseason (page 22 of supply order). Deducting auxiliary consumption of 10% we then arrive at the estimated export capacity figure.

combustion of biomass relative to the alternative fossil fuels for the supply of electricity, especially in relation to NOx, SOx and ash which arise in coal based generation (ash content of bagasse is of the order of 3-4% whilst Indian coal typically has an ash content of greater than 35%).

A.3. Project participants:

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Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	If Party wishes to be considered as a project participant
India (host)	LH Sugar Factories Ltd	No
UK	Agrinergy Ltd	No

Agrinergy Ltd is the designated official contact for the CDM project activity.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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India

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

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Uttar Pradesh

A.4.1.3. City/Town/Community etc:

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Pilibhit

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

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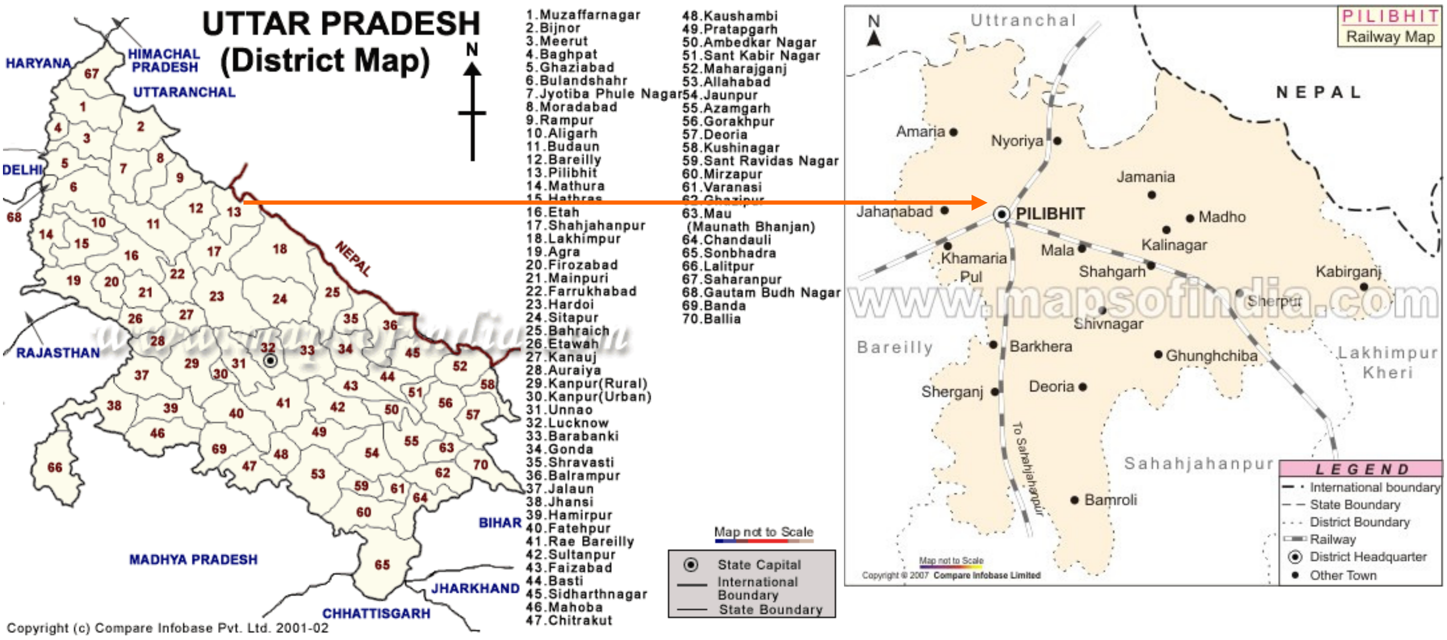
The project co-ordinates are 28°37’06.49”N and 79°49’10.75”E [3] which converts to + 28.618 latitude and + 79.819 longitude. This represents the turbine hall. See following map of project site.

[3] Source Google maps



A.4.2. Category(ies) of project activity:

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Category 1: Energy industries (renewable - / non - renewable sources)

A.4.3. Technology to be employed by the project activity:

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The technology employed is available in India and in the case of the project activity most of the technology is provided by local suppliers.

As highlighted in section A2 the purpose of the project activity is to provide electricity to the regional grid. The plant expects to export around 21.78MW of power to the grid in the season (when the adjacent factory is crushing cane) which is expected to be 180 days and 24.08MW during the offseason which is expected to be 50 days[4] through the grid connection established at the Roopurkamlu substation which is located at a distance of 5 km from the plant. The differences in these amounts are due to the fact that during the season the turbine will operate in a backpressure/condensing mode whilst in the offseason it will only operate in condensing mode – the condensing mode is more efficient as backpressure steam is not supplied and hence the turbine operates at a higher output. The main emission source that is considered in the context of the project activity is carbon dioxide and the reduction in this gas arises from the provision of renewable electricity, through the combustion of biomass residues, to the grid. The grid to which the project activity supplies electricity is pre-dominantly fossil fuel based.

[4] For the remaining days in the year, 135, the plant will be shutdown.

Prior to the project activity the following equipments were installed at the existing power and heat plant, these permitted a small quantity of electricity to be exported to the grid – the investment in which was undertaken as a previous CDM project. The existing power and heat plant is sufficient to meet the demands of the adjacent sugar factory and therefore constitutes a realistic baseline scenario.

	Capacity	Operating pressure kg/cm^2	Operating temperature ^oC	Manufacturer	Type
Boilers	45TPH	45	440	WIL	Bagasse fired
	45TPH	21	340	Thermax	Bagasse fired
	20TPH	21	340	Lipi	Bagasse fired
	80TPH	67	485	Walchandnagar Ind.	Bagasse fired
Turbines	3MW	45	440	Triveni	Back pressure
	2.5MW	21	325	APE Bellis	Back pressure
	1.5MW	21	325	BHEL	Back pressure
	12MW	65	510	Triveni	Back pressure

The 80 TPH boiler and the 12MW turbine generator are part of the existing small scale registered CDM project, project number 0334, "LHSF Bagasse Project".

As part of the project activity the main equipments that are installed are detailed below. In addition to the installation of these equipments the existing boilers of capacity 45 TPH and pressure 21kg/cm^2 and 20 TPH and the turbine generators of 2.5 MW and 1.5 MW capacity could continue to operate but are retired due to the installation of new biomass residue fired power and heat plant. Equipment will also be installed to limit particulate matter and ensure that the project activity complies with all local and national environmental legislation.

	Capacity	Operating pressure kg/cm^2	Operating temperature ^oC	Manufacturer	Type
Boiler	120TPH	67	510	Sitson	Bagasse fired,water tube
Turbine	26.75MW	65	510	Triveni	Extraction-condensing.

Energy meters will be installed throughout the plant to measure the generation, auxiliary consumption, export of electrical power. The existing metering in the power and heat plant also permits complete monitoring of electricity generation and consumption. In addition to the metering of energy the plant will install belt weighers to measure the biomass fed to the boiler and the biomass will be tested at the laboratory on site to determine its moisture content and calorific value.

The baseline scenario for the project activity as defined in section B4 of the PDD is scenario 11 of the methodology, specifically:
"The project activity involves the installation of a new biomass residue fired power and heat plant, which is operated next to (an) existing biomass residue fired power and heat plant. The existing plant is only fired with biomass residues. After the implementation of the project activity, the existing plant could continue to be operated (i.e. the plant is fully operational and have a remaining technical lifetime) but is retired due to the installation of the new biomass residue fired plant. The efficiency of electricity generation is higher in the new plant than in the existing plant. The biomass residues would in the absence of the project activity be used in the existing plant at the project site. Consequently, the power generated by the new plant would in the absence of the project activity be generated (a) in the existing

plant and – since power generation is more efficient in the project plant than in the existing plant – (b) partly in power plants in the grid. The heat generated by the project plant would in the absence of the project activity be generated in the existing power and heat plants. "

A.4.4 Estimated amount of emission reductions over the chosen crediting period:

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A seven year renewable crediting period has been chosen.

Year	Annual estimation of emission reductions in tonnes of CO_2e
Apr – Dec 2011	54,743
2012	72,992
2013	72,992
2014	72,992
2015	72,992
2016	72,992
2017	72,992
Jan – Mar 2018	18,247
Total estimated reductions (tonnes CO_2e)	**510,942**
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	72,992

A.4.5. Public funding of the project activity:

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The project has not received any public funding.

SECTION B. Application of a baseline and monitoring methodology

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

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The project activity follows the following methodology:
Version 10.1 of ACM0006 - Consolidated methodology electricity generation from biomass residues

In line with the application of the methodology the project draws on element of the following tools and methodologies:
Version 12.1 of ACM0002 - Consolidated methodology for grid-connected electricity generation from renewable sources
Version 02.2 Combined tool to identify the baseline scenario and demonstrate additionality.
Version 02 Tool to calculate the emission factor for an electricity system.

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

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The project which is a biomass residue fired electricity generation activity, meets all the applicability conditions for the methodology.

- The project activity involves the installation of a new biomass residue fired power and heat plant which is operated next to an existing power and heat plant fired with the same type of biomass residues, namely bagasse (**power capacity expansion project**). The project activity takes place adjacent to an agro-industrial unit, a sugar factory, from which it will receive the biomass residues.

- All the biomass used at the site qualifies under the definition of biomass residues as outlined in the methodology, i.e. the biomass residue is a by-product of agricultural activities and no other types of biomass residues will be used. In the case of the project the biomass residue will be bagasse, which is generated from the crushing of sugar cane.

- The implementation of the project does not result in an increase in the processing capacity of the raw input or any other changes in the sugar manufacturing process and the installation of the power and heat plant will not alter the crushing capacity of the sugar plant. The sugar factory has been expanding its crushing capacity to increase its sugar production capacity at regular intervals but does not currently plan to increase its processing capacity. The factory crushed 1,057,064 tonnes of cane in the 2007/08 season and 627,532 tonnes of cane in the 2008/09 season. In future the amount of raw input will be mainly dependent on the weather and decisions of the farmers to plant cane. However the existing set-up is capable of meeting the heat and electrical requirements of the new crushing capacity and therefore the implementation of the project does not impact the decision to expand the sugar factory.

- The biomass residues used by the project will not be stored for more than one year. Small quantities of biomass residues may be held over from one season to the next to be used as start up fuel but this would only imply storage from the end of the season to the start of the new season. The actual length of this will depend on the running hours of the plant and the length of the sugar crushing season.

- The biomass residue is not prepared prior to its use in the boiler, the bagasse is transferred from the crushing process directly to the boiler or storage yard.

The methodology requires the use of the ‘Combined tool to identify the baseline scenario and demonstrate additionality’. One of the alternative baseline scenarios of the project is P4: Generation of power to the grid.

The combined tool states that “Methodologies using this tool are only applicable if all potential alternative scenarios to the proposed project activity are available options to project participants”.

Regarding this a clarification has been sought, AM_CLA_0120:

https://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_WTBRGR4GLADG40BXRMFHX6WEGF3MQW
In line with the clarification on version 6.2 of the methodology, there has been no change in the later versions (7, 8 9 and 10) with respect to the use of the tool. Hence, the original approach is retained and the baseline and additionality are determined using the 'Combined tool to identify the baseline scenario and demonstrate additionality'.

B.3. Description of the sources and gases included in the project boundary

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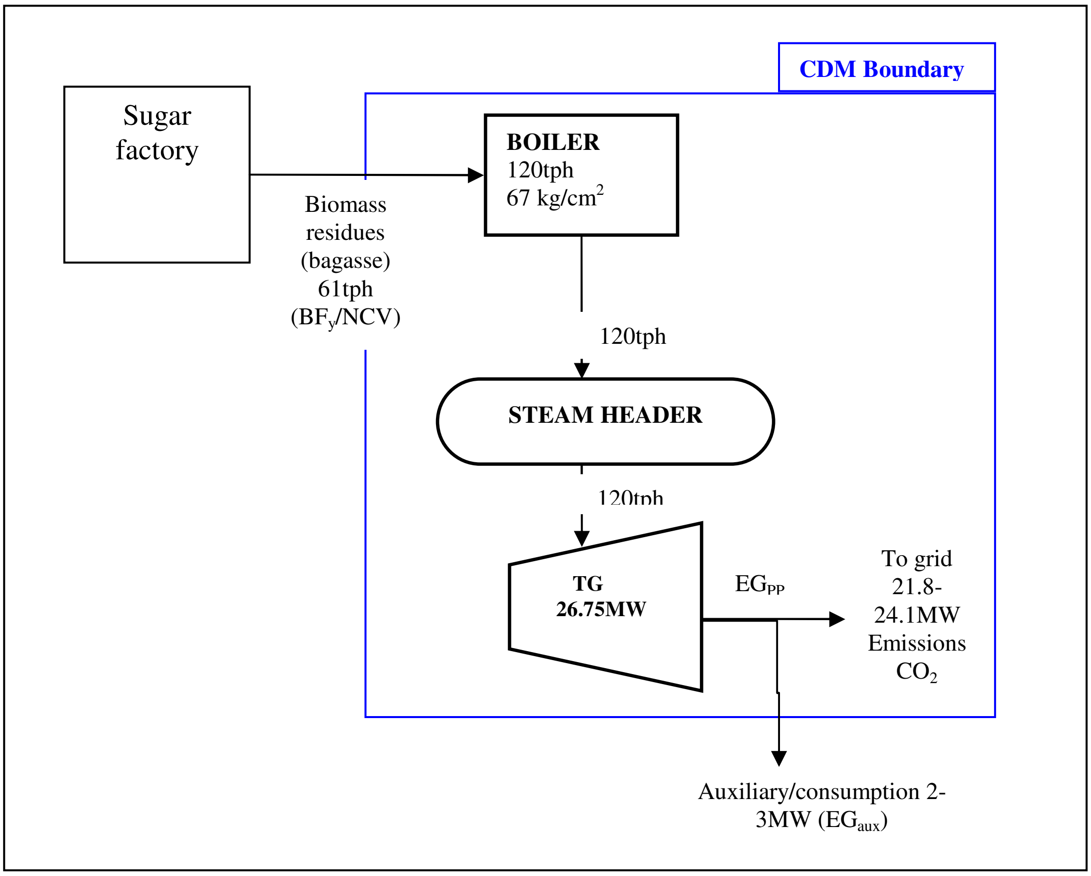
	Source	Gas	Included?	Justification/Explanation
Baseline	Grid electricity generation	CO_2	Yes	Main emission source
	Heat generation	CO_2	No	No emission reductions are claimed for heat and it is also shown that the efficiency of heat generation is greater in the project activity relative to the baseline scenario.
	Uncontrolled burning or decay of Surplus biomass.	CH_4	No	Not applicable under the selected baseline scenario, B4 is the biomass baseline scenario
Project activity	On-site fossil fuel consumption due to the project activity	CO_2	No	No fossil fuel will be consumed at the project site due to the project activity. Consumption by the project activity at start up can be provided by the existing power and heat plants which are all biomass residue based and therefore there will also be no electricity consumption either from fossil fuel sources that is not accounted for.
	Off-site transportation of biomass	CO_2	No	All biomass will be utilized from the sugar mill situated adjacent to the project activity
	Combustion of biomass for electricity and/or heat generation	CH_4	No	Emissions from uncontrolled burning or decay of biomass are not included in the baseline scenario and these sources are therefore not accounted for in project activity emissions.

The project boundary includes the equipment installed for the operation of the new power and heat plant, the main elements of which are the boilers, turbine generators, condenser, water treatment plant, effluent treatment plant, electrostatic precipitator, step up plant/transformers, transmission lines and the Northern regional grid. The effluent treatment plant will not however give rise to any methane emissions and there is therefore no requirement to include this source in the project emissions.



Fly ash is analysed in the context of the project boundary but it will be disposed of in line with consents from local bodies. The point to note is that in the baseline scenario a far greater quantity of fly ash would be generated as Indian coal[5] has a much higher ash percentage than bagasse and this would have to be transported to the disposal site. The transport of bagasse to the boiler is via conveyor but this is a normal practise in any sugar mill and the boilers in the project activity are located adjacent to the sugar factory.

As the boundary for the determination of the grid carbon emission factor in India is not clearly defined we follow the guidance in the Tool to calculate the emission factor for an electricity system. The DNA has to date not issued guidance on the delineation of grid boundaries and we therefore follow the guidance for the layered dispatch systems and adopt a regional grid. The Indian electricity system is split into two regional grids the North East West North Eastern grid and the Southern grid. The project activity falls under the North East West North Eastern grid and we use the CEF for this grid.

There is an existing small scale registered CDM project at the site but this is separate from the project activity. The methodology also allows the two projects to remain distinct as the generation from the existing small scale project is part of historic generation for the purpose of applying the methodology.

[5] http://www.coal.nic.in/

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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The determination of the baseline scenario and the demonstration of additionality follows Version 02.2 of the “Combined tool to identify the baseline scenario and demonstrate additionality”. This requires us to consider the most conservative baselines for the generation of power, the generation of heat and the use of biomass which is undertaken in the following section. Therefore Step 1 of the tool is presented in this section and Step 2, 3 and 4 are presented in section B5.

Step 1: Identification of alternative scenarios

Step 1a: Define alternative scenarios to the proposed CDM project activity

The methodology lists the alternative scenarios for each of the outputs of the project activity, namely power, heat and biomass. The following section analyses each of these in turn to arrive at the most credible baseline scenarios.

There are 11 power baseline alternatives detailed in the methodology. The following table outlines the power baselines and the reason why the project activity would be applicable under a particular baseline.

Power Baseline	**Description**	**Applicability**	**Justification**
P1	The proposed project activity not undertaken as a CDM project activity.	Not applicable but automatically included	Without the registration of the project as a CDM it would not occur, this is however included as a baseline scenario as part of the application of the tool.
P2	The continuation of power generation in an existing biomass residue fired power and heat plant at the project site, in the same configuration, without retrofitting and fired with the same type of biomass residues as (co-)fired in the project activity	Applicable	The power would be generated in the existing power plant as the current system is capable of sufficient electricity for the captive consumption in the process.
P3	The generation of power in an existing captive power and heat plant, using only fossil fuels	Not applicable	In the context of project activity this represents the existing power plant at the sugar factory. Historically the power has been generated using only biomass residue i.e bagasse and therefore this does not represents a realistic baseline scenario.

P4	The generation of power in the grid	Applicable	The generation of power in the grid is applicable as the power plant will supply electricity to the grid. In the absence of the project activity this would be generated in the grid.
P5	The installation of a new biomass residue fired power and heat plant, fired with the same type and with the same annual amount of biomass residues as the project activity, but with a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project plant and therefore with a lower power output than in the project case.	Not applicable	The installation of a new biomass fired power plant is not considered a realistic baseline scenario as the factory has sufficient steam and electricity for its requirements and will continue with the current situation.
P6	The installation of a new biomass residue fired power and heat plant that is fired with the same type but with a higher annual amount of biomass residues as the project activity and that has a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project activity. Therefore, the power output is the same as in the project case.	Not applicable	Same as P5.
P7	The retrofitting of an existing biomass residue fired power and heat, fired with the same type and with the same annual amount of biomass residues as the project activity, but with a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project plant and therefore with a lower power output than in the project case.	Not applicable	The factory will not undertake any retrofit and will continue with the current set up.
P8	The retrofitting of an existing biomass residue fired power and heat plant that is fired with the same type but with a higher annual	Not applicable	Same as P7.

	amount of biomass residues as the project activity and that has a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project activity.		
P9	The installation of a **new** fossil fuel fired captive power and heat plant at the project site	Not applicable	The PP would not install a fossil fuel boiler as the factory sufficiently meets its captive power requirement.
P10	The installation of a new single- (using only biomass residues) or co-fired (using a mix of biomass residues and fossil fuels) cogeneration plant with the same rated power capacity as the project activity power and heat plant, but that is fired with a different type and/or quantity of fuels (biomass residues and/or fossil fuels). The annual amount of biomass residue used in the baseline scenario is lower than that used in the project activity	Not applicable	The PP would not install a single- or co-fired cogeneration plant as the factory sufficiently meets its captive power requirement.
P11	The generation of power in an existing fossil fuel fired cogeneration plant co-fired with biomass residues, at the project site	Not applicable	Same as P3

We therefore conclude that scenarios P2 and P4 are the most realistic and conservative scenarios for power.

There are 10 heat baseline alternatives as outlined in the following table:

Heat Baseline	Description	Applicability	Justification
H1	The proposed project activity not undertaken as a CDM project activity	Not applicable but automatically included	Without the registration of the project as a CDM it would not occur, this is however included as a baseline scenario as part of the application of the tool.
H2	The proposed project activity (installation of a power and heat plant), fired with the same type of biomass residues but with a different efficiency of heat	Not applicable	This is not applicable as there is no need for the factory to install a lower efficient plant and the current set up is capable to

	generation (e.g. efficiency that is in common practice in the relevant industry sector)		satisfy captive requirement.
H3	The generation of heat in an existing captive power and heat plant using only fossil fuels	Not applicable	Not a realistic as the factory as not been using any fossil fuel in the past.
H4	The generation of heat in boilers using the same type of biomass residues	Not applicable	H4 implies that only heat is generated and this is only likely to arise where the sugar factory requires additional heat when there is an existing cogeneration unit established already. As this is not the case and therefore not applicable.
H5	The continuation of heat generation in an existing biomass residue fired power and heat plants at the project site, in the same configuration, without retrofitting and fired with the same type of biomass residues as in the project activity	Applicable	This represents the continuation of the current situation and is the most realistic baseline scenario.
H6	The generation of heat in boilers using fossil fuels	Not applicable	Fossil fuel is not credible as the availability of biomass residues from the adjacent sugar factory will normally take precedence and is a more conservative baseline.
H7	The use of heat from external sources, such as district heat	Not applicable	The availability of biomass residues from the adjacent sugar factory will normally take precedence over other sources of heat. Furthermore the location of sugar factories normally results in it being very unlikely that there is ever a district heating source or centralised source of heat serving users in the area.
H8	Other heat generation technologies (e.g. heat pumps or solar energy)	Not applicable	Again the availability of biomass residues from the adjacent sugar factory will normally take precedence in the determination of heat generation over other

			technologies. Solar and heat pumps are unlikely to provide the scale of heat required and may therefore be ruled out as credible baselines.
H9	The installation of a **new** single- (using only biomass residues) or co-fired (using a mix of biomass residues and fossil fuels) power and heat plant with the same rated power capacity as the project activity power and heat plant, but that is fired with a different type and/or quantity of fuels (biomass residues and/or fossil fuels). The annual amount of biomass residue used in the baseline scenario is lower than that used in the project activity.	Not applicable	The factory meets its steam requirements and hence will not install a cogeneration plant.
H10	The generation of power in an existing fossil fuel fired cogeneration plant co-fired with biomass residues, at the project site	Not applicable	The sugar factory has historically used bagasse and will not use any fossil fuel.

From the alternatives listed above H5 is a more realistic and conservative representation of the baseline situation for heat.

There are 8 biomass baseline alternatives. The following table outlines the reasons for selecting the particular biomass baseline.

Biomass Baseline	Description	Applicability	Justification
B1	The biomass residues are dumped or left to decay under mainly aerobic conditions. This applies, for example, to dumping and decay of biomass residues on fields.	Not applicable	Biomass residues would be used in the baseline scenario by the existing plant for cogeneration.
B2	The biomass residues are dumped or left to decay under clearly anaerobic conditions. This applies, for example, to deep landfills with more than 5 meters. This does not apply to biomass residues	Not applicable	Same as B1

	that are stock-piled or left to decay on fields.		
B3	The biomass residues are burnt in an uncontrolled manner without utilising it for energy purposes.	Not applicable	Same as B1
B4	The biomass residues are used for heat and/or electricity generation at the project site.	Applicable	Biomass residues would be used in the baseline scenario by the adjacent sugar factory to generate power and heat. Only one type of biomass residue (bagasse) will be used in the project activity and therefore we limit our analysis of biomass residues to bagasse.
B5	The biomass residues are used for power generation, including cogeneration, in other existing or new grid connected power and heat plants.	Not applicable	Biomass residue would only be used by the sugar factory in consideration.
B6	The biomass residues are used for heat generation in other existing or new boilers at other sites.	Not applicable	Biomass residue would only be used by the sugar factory in consideration
B7	The biomass residues are used for other energy purposes, such as the generation of biofuels.	Not applicable	Biomass residue would only be used by the sugar factory in consideration for generation of heat and power in the baseline. The technology for the generation of biofuels (cellulosic ethanol) from biomass is not available in India and is not a credible baseline.
B8	The biomass residues are used for non-energy purposes, e.g. as fertilizer or as feedstock in processes.	Not applicable	Biomass residue would only be used by the sugar factory in consideration for generation of heat and power in the baseline.

From the alternatives listed above we can rule out all the scenarios apart from B4 as the biomass residues would be used in the baseline scenario by the adjacent sugar factory to generate power and heat. Only one type of biomass residue (bagasse) will be used in the project activity and therefore we limit our analysis of biomass residues to bagasse. This is a non-fossilised biodegradable organic material originating from the manufacture of sugarcane. Bagasse meets the criteria on biomass residues as it is a by-product of the sugar manufacturing process.

From the above analysis the scenario that relates to baseline outlined is scenario 11 – P4 and P2, H5 and B4.

Scenario	Baseline scenario			Description of the situation
	Power	Biomass	Heat (if relevant)	
11	P4 and P2	B4	H5	The project activity involves the installation of a new biomass residue fired power and heat plant, which is operated next to (an) existing biomass residue fired power and heat plant. The existing plant is only fired with biomass residues. After the implementation of the project activity, the existing plant could continue to be operated (i.e. the plant is fully operational and have a remaining technical lifetime) but is retired due to the installation of the new biomass residue fired plant. The efficiency of electricity generation is higher in the new plant than in the existing plant. The biomass residues would in the absence of the project activity be used in the existing plant at the project site. Consequently, the power generated by the new plant would in the absence of the project activity be generated (a) in the existing plant and – since power generation is more efficient in the project plant than in the existing plant – (b) partly in power plants in the grid. The heat generated by the project plant would in the absence of the project activity be generated in the existing power and heat plants.

Outcome of Step 1a:

The plausible alternatives to the project activity are therefore:

- The proposed project activity undertaken without being registered as a CDM project activity
- Continuation of the current situation

Sub-step 1b. Consistency with mandatory applicable laws and regulations

The above baselines are all in compliance with applicable legal and regulatory requirements, there is no regulation governing the installation of power and heat plants in sugar factories.

Outcome of Step 1b:

The plausible alternatives to the project activity are therefore:

- The proposed project activity undertaken without being registered as a CDM project activity
- The continuation of the current practise at the site

The other steps as outlined in the combined tool are detailed in the section below in the demonstration of additionality.

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 CDM project activity (assessment and demonstration of additionality): >>

That the project is not part of the baseline is demonstrated using the Combined tool to identify the baseline scenario and demonstrate additionality, version 02.2.

Step 1. Identification of alternatives

This has been undertaken in the previous section, B4, where the alternatives were identified as:

- The implementation of the project activity without CDM;
- The continuation of the current practise at the site.

Step 2. Barrier analysis

In applying the tool and as shown below in the investment analysis the alternative "The implementation of the project activity without CDM" would not be a viable option as it is not financially viable and we are therefore left with only one baseline alternative "The continuation of the current practise at the site". In order to demonstrate this we have undertaken an investment analysis of the project as shown below.

Step 3. Investment Analysis.

The financial indicator chosen is the internal rate of return of the project (IRR)[6]. This will be compared with the cost of financing which has been taken from the commercial lending rates and the guarantees for India. The commercial lending rates are published by the Reserve Bank of India website[7], the rate reported in January 2006 was 10.25% to 10.75%[8]. The guarantee for India has been obtained from the country risk premiums published by Damodaran for India for 2005 (i.e. applicable at the time of the investment decision in January 2006) which is 4.05%[9]. Combining these two rates we arrive at a benchmark of 14.3% for the proposed project.

Using this method provides a conservative benchmark as the most suitable benchmark would be the weighted average cost of capital for the company (See Tool for Demonstration and Assessment of Additionality, Substep 2(b), point 4c). This would be calculated on the basis of the cost of debt and the cost of equity but with the sharp appreciation in Indian stock markets prior to the start date, any cost of equity calculation result in an unrealistic value and furthermore the use of sectoral returns and betas to calculate the WACC have not been accepted in the past (sectoral betas and returns would be required to be used as the project owner is not a listed company).

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[6] The guidance contained within the additionality tool states that for benchmark analysis "the IRR shall be calculated as project IRR." However an equity IRR may be used when the project upgrades an existing process, this is however not the case.

[7] http://www.rbi.org.in/home.aspx

[8] http://www.rbi.org.in/scripts/WSSViewDetail.aspx?TYPE=Section&PARAM1=4

[9] http://pages.stern.nyu.edu/~adamodar/, then follow the link on the left hand side entitled "Updated data", then under the table half way down the page entitle "Data sets", follow the link within the table against "Discount rate estimation, Risk premium for other markets" select the link for the 2005 data which then lists all the risk premiums for countries to arrive at the figure of 4.05% quoted for India. The risk premium has been taken for 2005 (and not 2006) as this was in force at the investment decison date.

The calculation of the IRR is based on the revenues associated with the project – the sale of electricity. The costs associated with the project relate to the cost of operation and maintenance of the plant, administration and salaries, costs of line maintenance and the cost of fuel for the auxiliaries.

In our analysis of the revenues we have calculated the export of electricity to the grid, based on which the project activity will be paid, this is then deducted by the charges levied by the electricity board (2% of exports) and the reduction in exports due to grid trippings and sugar factory stoppages (10% of exports). Applying the tariff as stipulated in the PPA to the resultant exports then provides the revenue estimate for the project activity. In terms of revenues beyond the term of the PPA we have assumed that the price in the PPA will remain fixed.

In terms of the costs associated with the project activity, these are calculated on the investment cost which has been incurred in developing the project, these are expected to reach Rs 750m (million) but we have used the current costs incurred on Rs 730m. The on-going operation costs are associated with operation and maintenance, this is 4.1% of the investment cost and is in line with the operation and maintenance costs associated with the adjacent small scale CDM project. The administrative costs are estimated at 10% of revenues. Both of these costs are escalated over time to reflect expected increases. A fuel cost has also been incorporated which represents the costs of fuel that arises from the increased auxiliaries associated with the new power and heat plant. A UPEB maintenance cost has been incorporated which reflects the costs of line maintenance, as part of the PPA (clause 8.4) the project activity is responsible for this activity and this is charged at 1.5% of the investment costs in the grid connection by UPEB. Lastly interest on working capital has been included, this is calculated at the prevailing interest rate on working capital of 15% and calculated as the interest payable on 25% of the working capital assuming that this portion will be bank funded (total working capital is Rs 55m, therefore Rs 13.75m has been assumed to be bank financed).

The main values applied for the financial analysis and their source is shown in the following table.

Parameter	**Value**	**Source**
Investment cost	Rs 730.74m	Purchase orders
O&M cost	4.1% of investment cost	Third party estimates
Administrative cost	10% of revenues	Third party estimates
Fuel cost	Rs 800/tonne	Fuel sales receipts
UPEB line costs	1.5% of grid connection (Rs 129.4m)	PPA, clause 8.4
Interest rate on working capital	15%	Prevailing interest rate on working capital
Bank funded working capital	Rs 13.75m	Calculated as 25% of the total working capital
PPA price	Rs 2.86/kWh (with a fixed increase over 5 years)	Determined from tariff order issued by UPERC and the PPA
Electricity generated	106,315 MWh	Calculated
Electricity exported	83,934 MWh	From generated with deductions for net billable (from PPA) and grid trippings and plant stoppages (from historical data)

Adopting these assumptions we arrive at a project IRR of 12.47%. The benchmark is derived as 14.3% and it can therefore be clearly demonstrated that the financial indicator is below the benchmark. The inclusion of CDM revenues for the life of the project (20 years) yields a project IRR of 17.45% at a forward CER price of US$12/tCO2e and a Rupee/US$ exchange rate of 40.

In terms of the sensitivity analysis we focus on the investment cost, the power price,, the fuel prices, the administrative and the operation and maintenance costs.

The average PLF historically over the last 3 years of the existing (as well as the project activity) turbines has been approximately 80%. Also, it is important to note that the 12 MW turbine (which shows higher PLF) is a back pressure turbine in which the back pressure steam is used for the process. Therefore, it would continue to have a higher PLF. On the other hand, the project activity turbine is an extraction-cum-condensing turbine which has operated at a PLF of 64% over the period since commissioing. Therefore, our assumption of 80% is more conservative and is kept fixed at 80% over 20 years in the financials; hence justified.

Since there is no indication in the PPA regarding the escalation in the tariff from year 6 onwards, we have maintained it constant. However, a sensitivity analysis considering +/-10% is undertaken for this variable. The maximum increase in the tariff, where defined by the tariff order is Rs 0.05/kWh per year, amounts to merely 1.7% escalation in tariff from year 4 to year 5 (the maximum escalation; therefore, we believe that the sensitivity at +10% covers the possibility of future higher escalations.

We have performed the sensitivity analysis by escalating the tariff price by 10% in year 1 yielding a project IRR of 14.44%. However, since the PPA price is fixed for the first 5 years this situation is not realistic, we have escalated the tariff by 10% in year 6 yielding an IRR of 14.32%. Similarly, reducing the tariff by 10% gives an IRR of 6.73% (which is again not realistic given the PPA) and reducing it from year 6 gives an IRR of 10.54%. In these situations the project IRR crosses the benchmark of 14.3% by 0.02% but given the existing escalation in the tariff which is a maximum of Rs 0.05/kWh[10] it is unlikely that an escalation of this order of magnitude would be implemented.

PPA tariff	-10%	Base Price	+10%
Rs.	2.57	2.86	3.15
IRR	10.54%	12.47%	14.32%

The sensitivity analysis on fuel price is as below with a +10% and -10% variation, in both instances the project IRR remains below the benchmark:

Fuel price	-10%	Base Price	+10%
Rs.	720	800	880
IRR	13.19%	12.47%	11.81

The sensitivity analysis on the administrative costs is as below with a +10% and -10% variation, in both instances the project IRR remains below the benchmark:

[10] This is taken from the tariff order

Admin costs, Rs 1000	-10%	Base figure	+10%
Rs.		27761	
IRR	13.06%	12.47%	11.94%

The sensitivity analysis on O&M cost is as below with a +10% and -10% variation, in both instances the project IRR remains below the benchmark:

O&M costs, Rs 1000	-10%	Base figure	+10%
Rs.		29961	
IRR	13.13%	12.47%	11.87%

The sensitivity analysis on the investment cost is as below with a +10% and -10% variation, in both instances the project IRR remains below the benchmark:

Investment cost, Rs m	-10%	Base figure	+10%
Rs.	657.67	730.75	803.82
IRR	14.23%	12.47%	10.97%

It should be recognised that the project activity has not incorporated income tax in the analysis, there is a 10 year income tax holiday for such investments from the period when they make a income tax profit but minimum alternative tax (MAT) is applicable at 12.25% to book profits. However this may be accumulated and offset against the income tax payable over a four year period. We have not included income tax and given the tax complexities have excluded this from the analysis, however the impact of this would however be to further reduce the project IRRs.

Step 4. Common practice analysis

In the state [11]of Uttar Pradesh there are 119 sugar factories and the following have cogeneration as reported by the official UP Cane website[12].

Name	GSP	Comment
Balrampur Chini, Balrampur	NA	IFC carbon financed[13]
Simbholi Sugar Mills Ltd, Ghaziabad	NA	PPA 2002 therefore not under current power policy framework which is only in force from 2006

[11] Since the electricity tariff is state-specific, the correctness of the region can further be verified.
[12] See http://www.upcane.org/ and the file "Cogeneration status UPCANE.pdf" (http://www.upcane.org/Status%20of%20co-genration%20of%20Power.pdf) which has been provided from this site as an evidence. The list provided has excluded those plants that are not in sugar factories SIAL-SBEC, Bhandoria Power and Parle Biscuits and it also has excluded Kamlapur where the work has not been executed..
[13] This project is undertaken by the same group of companies as proposed the methodology submission NM0030 and is under finance from the IFC as a CDM project. The project is still under development as a CDM through the IFC. http://www.ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/fly_ClimateChangebrochure/$FILE/ClimateChange_6pbrochure.pdf

J K Sugar, Meergani	NA	PPA 2002 therefore not under current power policy framework which is only in force from 2006
Dwarikesh Sugar, Bijnore	NA	PPA 2002 therefore not under current power policy framework which is only in force from 2006
DSM Rozagaon, Barabanki	NA	PPA 2002 therefore not under current power policy framework which is only in force from 2006
Haidergarh Chini, Barabanki	NA	NM0030 meth submission
Triveni Engineering & Industries, Deoband	15/10/05 to 14/10/05	
DSCL Ajbapur	15/09/05 to 15/10/05	
Triveni Engineering & Industries, Khatauli	17/03/06 to 16/04/06	
LHSF, Pilibhit	15/10/05 to 14/11/05	
Akbarpur Chini	NA	PPA in 2005 which is therefore not under the current power policy framework and the plant only comprises a backpressure system.
Mawana, Meerut	14/08/06 to 17/09/06	
Tikaula Sugar Mills, Muzaffarnagar	20/05/08 to 18/06/08	
Ramgarh China, Sitapur	03/08/06 to 01/09/06	
Makarpur Chini, Gonda	29/01/08 to 27/02/08	
Ramgarh Chini, Sitapur	03/08/06 to 01/09/06	
Ramgarh Chini, Sahajahanpur	03/08/06 to 01/09/06	
K M Sugar,Faizabad	27/08/06 to 25/09/06	
Awadh Sugar, Hargaon	NA	Indian DNA provided
Upper Ganges, Bijnor	NA	Under contract for CDM development
Mawana Sugars, Meerut	19/08/06 to 17/09/06	
Mawana Sugars, Titawi	19/08/06 to 17/09/06	
Mawana Sugars, Meerut	19/08/06 to 17/09/06	
Simbhaoli Sugars, Ghaziabad	01/10/06 to 30/10/06	
DSCL Loni	NA	Under contract for CDM development but second phase which relates to 15MW grid supply is delayed.
DSCL Hariawan	NA	Under contract for CDM development but second phase which relates to 15MW grid supply is delayed.
Chilwaria Sugar, Bahraich	01/10/06 to 30/10/06	
Tikaula, Muzaffarnagar	20/05/08 to 18/06/08	
Triveni, Khatauli	15/11/06 to 14/12/06	

Dhampur Sugar	01/10/06 to 30/10/06	
DSM Sugar, Asmauli	01/10/06 to 30/10/06	
DSM Sugar, Mansurpur	01/10/06 to 30/10/06	
Dwarikesh Sugar, Bijnore	25/08/06 to 23/09/06	
Dwarikesh Sugar, Bareilly	05/06/07 to 04/07/07	
BHL Kinauni	23/09/06 to 28/10/06	
BHL THanabhawan	23/09/06 to 28/10/06	
BHL Bhudana	23/09/06 to 28/10/06	
BHL Bilai	23/09/06 to 28/10/06	
BHL Paliakalan	23/09/06 to 28/10/06	
BHL Khambhakhera	23/09/06 to 28/10/06	
BHL Varkhera	23/09/06 to 28/10/06	
BHL Gangnoli	23/09/06 to 28/10/06	

As evident from the table above all the plants that have been commissioned under a similar policy environment have been put up on the UN website for GSP or are under contract for their development as CDM. It is therefore fair to say that there is no evidence of similar projects of the same scale being undertaken without the benefit of CDM.

In line with the recent guidance on the consideration of the CDM and the timeline of the project we have provided in the table below the main steps.

CDM consideration (Board meeting minutes)	10th Jan 2006
Start date of CDM project, purchase order of boiler	24th April 2006
Registration of small scale CDM project undertaken by LHSF – "LHSF Bagasse project"	5th May 2006
Invitation from LHSF to provide proposal on 2nd CDM project	11th May 2006
Agreed terms on CDM development	22nd Nov 2006
Site visit by CDM consultant and PDD preparation	Jan to Mar 2007
DOEs invited to quote for validation	2nd May 2007
Term sheet for sale of CERs from project	5th July 2007
First GSP of the PDD (written in line with version 5 of ACM0006)	21st July 2007
Commissioning of power plant[14]	May 2008
Operation of power and heat plant	May 2008

As demonstrated the consideration of CDM took place early in overall development process and given that LHSF had already developed and registered a CDM project of the same type (but of a small scale) it is demonstrated that prior consideration took place[15]. The registered project is number 0334 "LHSF Bagasse Project" registered on 5th May 2006. The PDD for this project was submitted to the DOE TUV Sud on 17th August 2005 and was published for global stakeholder comments between 15th Oct 2005 to 14th Nov 2005.

B.6. Emission reductions:

[14] Minutes of Meeting with Triveni the turbine supplier have been submitted to support the commissioning date.

[15] https://cdm.unfccc.int/Projects/DB/TUEV-SUED1142621143.43/view

B.6.1. Explanation of methodological choices:

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The application of the baseline methodology results in scenario 11 of ACM0006, as outlined in B4. This requires the calculation of baseline emission associated with the electricity generation, the generation of heat and the usage of biomass. Broadly the emission reductions from the project are calculated from the application of the following equation:

$$ER_y = ER_{heat,y} + ER_{electricity,y} + BE_{biomass,y} - PE_y - L_y$$

where:

ER_y	Emission reductions of the project activity during the year y (tCO_2/yr)
$ER_{electricity, y}$	Emissions reductions due to displacement of electricity during the year y (tCO_2 /yr)
$ER_{heat, y}$	Emission reductions due to displacement of heat during the year y (tCO_2/yr)
$BE_{biomass, y}$	Baseline emissions due to natural decay or burning of anthropogenic source of biomass during the year y (tCO_2/yr)
PE_y	Project emissions during the year y (tCO_2/yr) and
L_y	Leakage emissions during the year y (tCO_2yr)

The methodology requires us to demonstrate for scenarios 11 that the lifetime of the baseline is consistent with the period that emission reductions are being claimed for. In the case of the project activity the existing power and heat plant has a technical lifetime in excess of the chosen crediting period and the details are given in Annex 3.

In terms of emission reductions due to heat generation we do not claim for these in the case of the project activity but are required to show that emissions do not arise from the combustion of more biomass. In line with the methodology this may be shown by demonstrating that the thermal efficiency in the project is larger than the baseline scenario and assuming $ER_{heat,y} = 0$. i.e.:

$$\varepsilon_{th,projectplant} > \varepsilon_{th,referenceplant}$$

In order to show this we have calculated the heat generated per unit of biomass in the project activity and shown that this is greater than or equal to the heat generated per unit of biomass in the baseline. This may be demonstrated on the basis of the specification of the boilers (operating temperatures and pressures) and the enthalpies.

Consideration of heat emissions

Baseline configuration, 21kg/cm², 310°C			***Project configuration, 67kg/cm², 515°C***		
Capacity	kg/hr	1	Capacity	kg/hr	1
Enthalpy out	kCal	727	Enthalpy out	kCal	824
Enthalpy in	kCal	100	Enthalpy in	kCal	180
Calorific value fuel	kCal/kg	1,813	Calorific value fuel	kCal/kg	1,813
Efficiency	%	68%	Efficiency	%	70%
Bagasse	kg/hr	0.51	Bagasse	kg/hr	0.51
Steam/bagasse	Mt/mt	1.966	Steam/bagasse	mt/mt	1.971

The net calorific value of bagasse is taken from E Hugot, Handbook of cane sugar engineering, 3rd edition, page 922 equation 41.20[16]. The above table therefore highlights that the project has a higher thermal efficiency than the baseline and therefore that $ER_{heat, y} = 0$.

In terms of baseline emissions, the main source in the project activity is through the generation of electricity. The calculation of these emissions are provided by the following equations.

$$ER_{electricity} = EG_y . EF_y$$

The emission factor, EF_y, is taken the "CO_2 baseline data for the Indian power sector" published by the Central Electricity Authority[17].

This is in line with the step 1 of the 'Tool to calculate the emission factor for an electricity system', which states that:

If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used. If such delineations are not available, project participants should define the project electricity system and any connected electricity system and justify and document their assumptions in the CDM-PDD.

The project activity falls within the NEWNE (North, East, West, North Eastern) grid for which the combined margin is calculated as 0.80 tCO_2e/MWh.

In terms of step 2 of the tool only grid based power plants have been included in the subset of plants that are analysed.

The determination of the operating margin is based on the Simple OM as outlined in step 3 of the tool. In order to use this method low cost/must run generation resources must constitute less than 50% of total generation – from the data published by the CEA it can be seen that low cost/must run constitute between 18 to 19% over the last 3 years. The Simple OM is determined *ex-ante*. The calculation of the Simple OM follows Option A of step 4 of the tool – examining the net electricity generation and emission factor of each power plant, using the following equations:

$$EF_{grid,OMsimple,y} = \frac{\sum_m EG_{m,y} . EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)

[16] The net calorific value is given by: *NCV= 4,250-12s-48.5w*, where *s* is the % of sugar in bagasse and *w* is the % of moisture in bagasse. For the above calculation we have assume *s* = 1% and *w* = 50%.

[17] Version 4, http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver4.pdf. The use of this emission factor has been accepted in other recently registered CDM projects.

m = All power units serving the grid in year *y* except low-cost / must-run power units
y = The relevant year as per the data vintage chosen in Step 3

and

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y}.NCV_{i,y}.EF_{CO2,i,y}}{EG_{m,y}}$$

Where:
$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
$FC_{i,m,y}$ = Amount of fossil fuel type *i* consumed by power unit *m* in year *y* (Mass or volume unit)
$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
m = All power units serving the grid in year *y* except low-cost/must-run power units
i = All fossil fuel types combusted in power unit *m* in year *y*
y = The relevant year as per the data vintage chosen in Step 3

The calculation of the build margin follows the guidance in Step 5 of the tool analysing the most recent power plant additions that constitute 20% of generation. The build margin is fixed *ex-ante* for the first crediting period thus following option 1 of Step5 of the tool and option A1 of Step 4 to determine the CO_2 emission factor of each unit. The following equation is used for the calculation of the build margin.

$$EF_{gridBM,y} = \frac{\sum_m EG_{m,y}.EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
m = Power units included in the build margin
y = Most recent historical year for which power generation data is available

The calculation of the combined margin follows Step 7 of the tool utilising weights of 50:50 against the Simple OM and build margin to arrive at the combined margin as shown by the following equation.

$$EF_{grid,CM,y} = EF_{grid,OM,y}.w_{OM} + EF_{grid,BM,y}.w_{BM}$$

Where:
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
w_{OM} = Weighting of operating margin emissions factor (%)
w_{BM} = Weighting of build margin emissions factor (%)

In line with scenario 11 EG_y is determined from

$$EG_y = MIN\left[\left(EG_{projectplant,y} - \varepsilon_{el,otherplant} \cdot \frac{1}{3.6} \cdot \sum_k BF_{k,y} \cdot NCV_k\right) and \left(EG_{total,y} - \frac{EG_{historic,3yr}}{3}\right)\right]$$

Where:

EG_y	Net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y in MWh/yr
$EG_{project\ plant,\ y}$	Net quantity of electricity generated in the project plant during the year y in MWh/yr
$\varepsilon_{el,\ other\ plants(s)}$	is the average net energy efficiency of electricity generation in (the) other power plant(s) that would use the biomass residues fired in the project plant in the absence of the project activity, expressed in $MWh_{el}/MWh_{biomass}$[18]
$BF_{k,\ y}$	Quantity of biomass type k used fuel in the project plant during the year y in tons of dry matter
NCV_k	Net calorific value of the biomass type k (GJ/ton of dry matter)
$EG_{total,y}$	Net quantity of electricity generated in all power plants at the project site, generated from firing the same type of biomass residue as in the project plant, including the new power and heat plant installed as part of the project activity and any previously existing plant during the year y (MWh/yr)
$EG_{historic,\ 3yr}$	Net quantity of electricity generated during the most recent three years in all power and heat plants at the project site, generated from firing the same type of biomass residue as in the project plant (MWh)

In terms of baseline emission arising from the natural decay or uncontrolled burning of biomass we do not claim for these as the biomass would be combusted in the baseline scenario, therefore $BE_{biomass,\ y} = 0$.

The project emissions arising from the project activity are limited to four sources; combustion of fossil fuels for the transport of biomass to the site, on-site consumption of fossil fuels, electricity consumption at the site attributable to the project activity and methane emissions from the combustion of biomass. As the biomass will be produced in the adjacent sugar factory there will be no emissions arising from the transportation of biomass. The project activity does not plan to co-fire any fossil fuels in the boiler (the boiler is designed to combust only bagasse) and therefore emissions from these sources are not included and as we do not seek to claim baseline emissions from the decay of biomass we are not required to account for the methane emissions from the combustion of biomass. In terms of electricity consumption arising as a result of the project activity this is not included as the only consumption will be from the auxiliaries which already accounted for in the baseline calculation. Therefore $PE_y = 0$.

The last area of analysis required in the determination of the emission reductions is leakage, in line with the methodology leakage is not considered for scenario 11 and therefore $L_y = 0$.

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

(Copy this table for each data and parameter)

[18] For scenario 11, $\varepsilon_{el,\ other\ plant}$ corresponds to the average net efficiency of electricity generation in the existing power plant fired with the same type of biomass residue at the project site. Therefore $\varepsilon_{el,\ other\ plant} = \varepsilon_{el\ existing\ plant}$

Data / Parameter:	**$EG_{historic,3yr}$**
Data unit:	MWh
Description:	Historic 3 year average net generation of existing power and heat plant
Source of data used:	Plant records
Value applied:	24,408.63
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data for generation have been historically measured by energy meters situated on the site. The net generation has been determined by subtracting auxiliary consumption from total generation. Historically this data has been collected daily and has been held at the plant.
Any comment:	Data is provided in Annex 3

Data / Parameter:	**$\varepsilon_{el,existing\_plant}$**
Data unit:	$MWh_{el}/MWh_{biomass}$
Description:	Average net efficiency of electricity generation in the existing power and heat plant
Source of data used:	Calculated from consumption of biomass and electricity generation in the other plant
Value applied:	0.02277
Justification of the choice of data or description of measurement methods and procedures actually applied :	The calculation of the $MWh_{el}/MWh_{biomass}$ is carried on the basis of 3 years' historic data available at the site regarding power generation and the bagasse consumed in the power and heat plant.
Any comment:	Full data set provided in Annex 3

Data / Parameter:	**EF_y**
Data unit:	tCO_2/MWh
Description:	CO_2 emission factor for the electricity displaced due to the project activity during the year y (t CO_2/MWh)
Source of data used:	Central electricity authority, Govt. of India[19] Version 4
Value applied:	0.80 (2007-2008)
Justification of the choice of data or description of measurement methods and procedures actually applied :	Based on tool to calculate grid emission factor
Any comment:	Fixed ex-ante

Data / Parameter:	**$EG_{m,y}$**
Data unit:	MWh

[19] http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

Description:	Net generation by power and heat plant m in year y
Source of data used:	Central electricity authority, Govt. of India[20] Version 4
Value applied:	Varies across plants, see tab Data of http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver4.pdf
Justification of the choice of data or description of measurement methods and procedures actually applied :	Determined by the Central Electricity Authority
Any comment:	NA

Data / Parameter:	**$FE_{EL,m,y}$**
Data unit:	tCO_2/MWh
Description:	Carbon dioxide emission factor of power plant m
Source of data used:	Central electricity authority, Govt. of India[21] Version 4
Value applied:	Varies across plants, see tab Data of http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver4.pdf
Justification of the choice of data or description of measurement methods and procedures actually applied :	Determined by the Central Electricity Authority
Any comment:	NA

Data / Parameter:	**$EF_{grid,OM,y}$**
Data unit:	tCO_2/MWh
Description:	Simple OM emission factor
Source of data used:	Central electricity authority, Govt. of India[22] Version 4
Value applied:	1.00
Justification of the choice of data or description of measurement methods and procedures actually applied :	Determined by the Central Electricity Authority
Any comment:	NA

Data / Parameter:	**$EF_{grid,BM,y}$**
Data unit:	tCO_2/MWh
Description:	Build margin emission factor

[20] http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm
[21] http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm
[22] http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

Source of data used:	Central electricity authority, Govt. of India[23] Version 4
Value applied:	0.60
Justification of the choice of data or description of measurement methods and procedures actually applied :	Determined by the Central Electricity Authority
Any comment:	NA

B.6.3 Ex-ante calculation of emission reductions:

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For the purposes of determining the emission reductions for the project activity we apply the following equation:

$$ER_y = ER_{heat,y} + ER_{electricity,y} + BE_{biomass,y} - PE_y - L_y$$

This may be simplified to:

$$ER_y = ER_{electricity,y}$$

Where:

ER_y	are the emission reductions of the project activity during the year y in tons of CO_2
$ER_{electricity,\ y}$	are the emission reductions due to the displacement of electricity during the year y in tons of CO_2

As outlined earlier $ER_{heat,y}$, $BE_{biomass,y}$, PE_y and L_y have not been considered in the equation as it has been shown that these are equal to zero. In the case of $ER_{heat,y}$ this variable is equal to zero as additional heat is not required nor are reductions being claimed for heat. In the case of $BE_{biomass,y}$ we have not taken account of the reductions that arise from the combustion of biomass as the biomass would be combusted in the baseline scenario. In the case of L_y no leakage effects result from the implementation of the project activity. In the case of PE_y we have shown that these would not arise and are therefore equal to zero.

In order to calculate the baseline emissions we apply the following equations.

$$EG_y = MIN\left[\left(EG_{projectplant,y} - \varepsilon_{el,otherplant} \cdot \frac{1}{3.6} \cdot \sum_k BF_{k,y} \cdot NCV_k\right) and \left(EG_{total,y} - \frac{EG_{historic,3yr}}{3}\right)\right]$$

The emission reductions due to electricity generation are the product of EG_y determined above and the grid based emission factor, EF_y as given in section B6.2.

[23]http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

$EG_{historic, 3yr}$ = 24,409 MWh
$EG_{total,y}$ = 152,971MWh per year
$EG_{project\ plant}$ = 106,315 MWh/yr
BF_k = 134,452 tonnes
NCV_k = 17.73 GJ/tonnes
$\varepsilon_{el, existing\ plant}$ = 0.02277

$$ER_{electricity} = EG_y . EF_y$$

Where:

$ER_{eletricity, y}$	Emission reductions relating to the electricity generation from the project activity tCO_2e
EG_y	Net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y in MWh
EF_y	CO_2 emission factor for the electricity displaced due to the project activity during the year y (t CO_2/MWh)

EF_y has been set at 0.80 tCO_2e/MWh and combining this with EG_y (91,240 MWh/yr) gives $ER_{electricity, y}$ = 72,992 tCO_2e/yr.

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

>>

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
Apr – Dec 2011	0	54,743	0	54,743
2012	0	72,992	0	72,992
2013	0	72,992	0	72,992
2014	0	72,992	0	72,992
2015	0	72,992	0	72,992
2016	0	72,992	0	72,992
2017	0	72,992	0	72,992
Jan – Mar 2018	0	18,247	0	18,247
Total tonnes of CO_2e	0	**510,942**	0	**510,942**

B.7 Application of the 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:	**$EG_{Projectplant, y}$**
Data unit:	MWh/yr
Description:	Net electrical energy generated by the project activity
Source of data to be	Plant records

used:	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	106,315
Description of measurement methods and procedures to be applied:	The project activity will install a SCADA reporting system which will permit continuous monitoring and measurement. Hourly recordings of gross generation data will be taken from energy meters located at the project activity site. This data will be recorded hourly by the Switch Board attendant and entered into logbooks on site. This hourly data will be signed off at the end of every shift by an engineer in charge of the shift and again at the end of each day and signed off by the power and heat plant manager. Auxiliary consumption $EG_{aux, project plant, y}$ will then be deducted to arrive at the net value. The meters will be calibrated annually by an independent third party to the manufacturer's standard.
QA/QC procedures to be applied:	This may be cross checked from the quantity of biomass fired in the boiler using energy balance and also the electricity sales receipts.
Any comment:	The data will be kept for the later of, two years after the end of the crediting period or the last issuance of CERs for the project activity. 100% of the data will be monitored. The plant end metering is 0.5 accuracy class. The generation meters are located in the control room

Data / Parameter:	**$EG_{aux, project plant, y}$**
Data unit:	MWh/yr
Description:	Electrical energy consumption by the auxiliary units in the project power and heat plant
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	10% of project plant generation
Description of measurement methods and procedures to be applied:	The meters installed for auxiliary energy consumption will measure this data continuously and recordings will take place hourly. The meters will be calibrated annually by an independent third party to the manufacturer's standard.
QA/QC procedures to be applied:	Not required.
Any comment:	The data will be kept for the later of, two years after the end of the crediting period or the last issuance of CERs for the project activity. 100% of the data will be monitored. The plant end metering is 0.5 accuracy class The auxiliary consumption meters are located in the power house.

Data / Parameter:	$EG_{aux, total, y}$
Data unit:	MWh/yr
Description:	Electrical energy consumption by all the auxiliary units in the project activity as well as in the existing units.
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	10% of total generation
Description of measurement methods and procedures to be applied:	The meters installed for auxiliary energy consumption will measure this data continuously and recordings will take place hourly. The meters will be calibrated annually by an independent third party to the manufacturer's standard.
QA/QC procedures to be applied:	Not required.
Any comment:	The data will be kept for the later of, two years after the end of the crediting period or the last issuance of CERs for the project activity. 100% of the data will be monitored. The plant end metering is 0.5 accuracy class The auxiliary consumption meters are located in the power house

Data / Parameter:	$EG_{total, y}$
Data unit:	MWh/yr
Description:	Net electrical energy generated by the power and heat plant located at the site, new and existing units
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	152,971
Description of measurement methods and procedures to be applied:	The data from the project activity will be monitored as set out above, for the existing power and heat plant hourly recordings of gross generation data will be taken from energy meters located at the site. This data will be recorded hourly by the Switch Board attendant and entered into logbooks on site. This hourly data will be signed off at the end of every shift by an engineer in charge of the shift and again at the end of each day and signed off by the power and heat plant manager. Auxiliary consumption $EG_{aux, total, y}$ will then be deducted from the gross generation figure to arrive at the net value. The meters will be calibrated annually by an independent third party to the manufacturer's standard.

QA/QC procedures to be applied:	This may be cross checked from the quantity of biomass fired in the boiler using energy balance.
Any comment:	The data will be kept for the later of, two years after the end of the crediting period or the last issuance of CERs for the project activity. 100% of the data will be monitored. The plant end metering is 0.5 accuracy class

Data / Parameter:	**$BF_{k,y}$**
Data unit:	tons of dry matter
Description:	Quantity of biomass residue type *k* combusted in the project plant during the year y
Source of data to be used:	On-Site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	134,452
Description of measurement methods and procedures to be applied:	A belt weigher will be installed to measure the quantity of bagasse used in the project activity. Recordings from this meter will be taken daily. These readings will then be adjusted to a dry weight basis through sample of bagasse tested in the laboratory on-site. The data will be kept for the later of, two years after the end of the crediting period or the last issuance of CERs for the project activity. 100% of the data will be monitored. The meters will be calibrated annually by an independent third party to the manufacturer's standard.
QA/QC procedures to be applied:	Crosscheck the measurements with an annual energy balance where the quantity of biomass shall be crosschecked with the quantity of electricity (and heat) generated and any fuel purchase receipts (if available).
Any comment:	Dry weight The location of the meter is in the boiler operational control room

Data / Parameter:	**NCV_k**
Data unit:	GJ/ton of dry matter or GJ/liter
Description:	Net calorific value of biomass residue type *k*
Source of data to be used:	Laboratory Measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	17.7318
Description of measurement methods and procedures to be	The measurement of the NCV will be undertaken by a reputed 3rd party nationally accredited laboratory. This will be reported every six months (taking at least three samples for each measurement). The data will be kept for the later of,

applied:	two years after the end of the crediting period or the last issuance of CERs for the project activity.
QA/QC procedures to be applied:	Consistency of the measurements by comparing the measurement results with relevant data sources (e.g. values in the literature, values used in the national GHG inventory), default values by the IPCC and previous years' measurements. If the measurement results differ significantly from previous measurements or other relevant data sources, additional measurements will be conducted. NCV will be determined on the basis of dry biomass.
Any comment:	Net Calorific Value of Bagasse.

Data / Parameter:	**Moisture content of biomass residues**
Data unit:	% water content
Description:	Moisture content of bagasse
Source of data to be used:	On – site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	50%
Description of measurement methods and procedures to be applied:	Measured for each batch of biomass of homogeneous quality. A weighted average will be reported for each monitoring period. The moisture content of bagasse is measured through the use of a calibrated weigh scale and oven. Approximately 100 gram samples of bagasse are taken from the last mill used to crush the cane and these are taken to the on-site laboratory. The samples are weighed and then placed in an oven at 105 ^{o}C for an hour. The sample is then removed and the re-weighed to determine the moisture content.
QA/QC procedures to be applied:	Not required as per methodology
Any comment:	

B.7.2 Description of the monitoring plan:

>>

The monitoring of data revolves around the electricity generation from the new and existing turbine generators and the auxiliary consumption of these power and heat plant. All auxiliary units at the power and heat plant will be monitored and the meters will be checked and calibrated annually to ensure the quality of the data. There will also be main meters attached to each turbine generator to determine their total generation which again will be calibrated annually.

The electricity generation records will be maintained in log books on eight hourly basis for both the new and the existing power and heat plant. These records will then be collated at the end of every shift and then again at the end of every day and signed off by the power and heat plant manager. In addition the data will be collated on a daily basis by the General Manager (Technical) and this will be the basis for emission reductions calculation. However, SCADA will also record data on a continuous basis and will act as a back up.

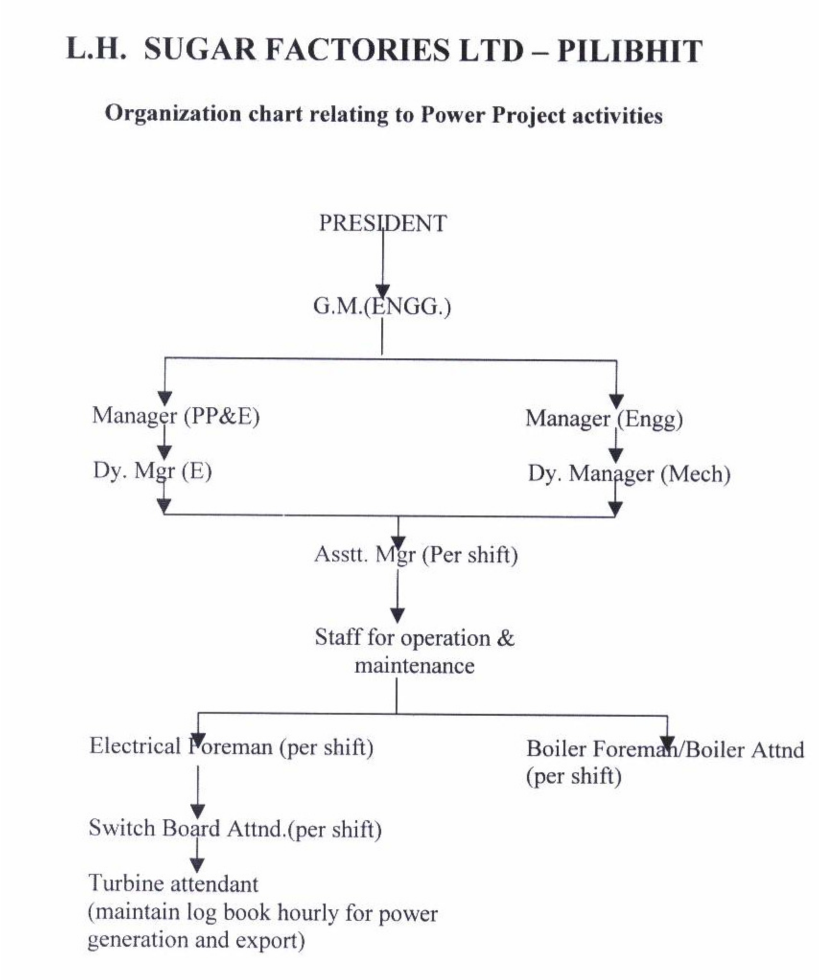
As set out in Section D the site requires an annual Approval to Operate from the Uttar Pradesh Pollution Control Board, this will be incorporated into the monitoring plan and will be produced at the time of verification.

The recording of data will be carried out by switchboard operators who will report this to the shift engineer, the shift engineers will report to the power and heat plant manager. The daily electricity generation will be part of the overall management information systems of the factory and on the basis of these reports monthly emission reduction reports will be provided by Agrinergy to the project activity. All data will be kept for a minimum of 2 years following issuance of certified emission reductions or the end of the crediting period, whichever is later, and the storage of this data will be the responsibility of the project developers.

The biomass used from the adjacent sugar plant will be monitored through the measurement of bagasse combusted in the power and heat plant using a belt weigher.

The net calorific value and moisture content will be taken from the laboratory measurements at the sugar factory. The moisture content will be measured continuously with mean values taken annually, whilst the net calorific value will be determined from 3 samples taken every 6 months.

The organisation chart for the project activity is given below.



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

>>
09/03/2007
Ben Atkinson, Agrinergy Ltd, project participant, contact details as listed in Annex I.
Mr. B P Dixit, LHSF, project participant, contact details as listed in Annex I.

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:

>>
24/04/2006
The purchase order for the boiler can be considered as the start date as this is the first real action with financial commitments (the boiler and turbine are the long lead time orders and as evidenced from the purchase orders the boiler was ordered prior to the turbine).

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

>>
20y 00m

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

A seven year renewable crediting period is chosen.

C.2.1. Renewable crediting period

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

>>
01/04/2011 or the date of registration, whichever is later

C.2.1.2. Length of the first crediting period:

>>
7y 00m

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
Not applicable

C.2.2.2. Length:

>>
Not applicable

SECTION D. Environmental impacts

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D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

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In relation to the baseline scenario no significant environmental impacts will arise as a result of the project activity. The project activity has however conducted an EIA and this has been provided to the validator.

The positive environmental impacts arising from the project activity are:

- A reduction in carbon dioxide emissions from the replacement of fossil fuels which would be generated under the baseline scenario
- A reduction in the emissions of other harmful gases (NOx and SOx) that arise from the combustion of coal in power generation

- A reduction in ash in comparison to the baseline scenario due to the lower ash content of bagasse relative to coal (5% versus 45% respectively).

The power and heat plant currently meets all environmental legislations as set out by the State Pollution Control Board and there will be on-going monitoring of the plant by this state body. A "No objection certificate" has been obtained from the Uttar Pradesh Pollution Control Board for the project activity. A "Consent to operate" will be provided annually and this will form part of the monitoring procedures.

The plant will install an electrostatic precipitator at the exit of the boiler to limit suspended particulate matter in the flue gases to less than 150 mg/Nm^3. The waste water from the power and heat plant will be treated at the effluent treatment plant and once treated will meet the norms as stipulated by the State Pollution Control Board. The effluent treatment plant is aerobic and hence will not give rise to any emissions of methane.

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:

>>

Environmental impacts are not considered significant.

SECTION E. Stakeholders' comments

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

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The stakeholder review was conducted on three levels:

A local stakeholder review

A national stakeholder review undertaken through the approval by the Designated National Authority, the Ministry of Environment and Forests (MoEF), and consent to operate from the Uttar Pradesh Pollution Control Board.

The application to the MoEF was made in June, 2007 and the project subsequently made a presentation to the MoEF and other ministries that constitute the DNA. The project activity has received the Host Country Approval from the DNA.

Regarding the local stakeholder review a letter has also been sent to the Pilibhit District Administration and the local Cane Society informing them of the project activity and inviting comments. The Cane Society represents over 40,000 farmers who deliver sugar cane to the factory. The details of the project were also published in a local paper and comments have been invited.

E.2. Summary of the comments received:

>>

As per the district sugarcane commissioner and the farmers, the utilization of bagasse for power and heat generation will pose no problem in the area. Therefore, they have demonstrated support and no objection to the proposed project activity. In addition, a 'no objection certificate' has been issued by the chairman of the Zilla Parishad in order to promote power generation using cleaner fuels.

The newspaper ad was published on 7/02/2007 in ‘Amar Ujala Pilibhit news’.

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

>>
Since the stakeholders had no objection, the project proponent proceeded with the installation of the project activity.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	L H Sugar Factories Ltd.
Street/P.O.Box:	Civil Lines
Building:	
City:	Pilibhit
State/Region:	Uttar Pradesh
Postcode/ZIP:	262001
Country:	India
Telephone:	+91 (0)5882 255859
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E-Mail:	lhsugar@rediffmail.com
URL:	
Represented by:	
Title:	President
Salutation:	Mr.
Last Name:	Dixit
Middle Name:	
First Name:	B.P
Department:	
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Direct FAX:	
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Personal E-Mail:	

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Represented by:	
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Salutation:	Mr
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Middle Name:	
First Name:	Ben
Department:	
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Direct FAX:	
Direct tel:	
Personal E-Mail:	moc@agrinergy.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The project has not received any public funding.

Annex 3

BASELINE INFORMATION

The data used for the determination of baseline variables is given below and is sources from plant records. The data for the existing plant is from the entire existing power plant as measurement in the past has been conducted on this basis and not for each individual plant.

Historic Generations at the sugar factory

Year	MWh	Aux (8.5%)	Net (MWh)
2003-2004	17,182.54	1460.52	15722.02
2004-2005	22,184.35	1,885.67	20,298.68
2005-2006	40,661.41	3,456.22	37,205.19
			24,408.63

Bagasse consumed in the power and heat plant

Year	Tonnes
2003-2004	155,476.2
2004-2005	194,387.6
2005-2006	283,948.0

$\varepsilon_{el,\ existing\ plant}$

NCVbiomass	MWh/tonnes	4.9279

Year	MWh el	MWh biomass	$\varepsilon_{el,\ existing\ plant}$
2003-2004	15,722.02	766171.12	0.02052
2004-2005	20,298.68	957922.75	0.02119
2005-2006	37,205.19	1399267.45	0.02659
Average			0.02277

Biomass Scenario

Factory in 2006-2007			Source
Days of operation		187.7	RT8C
Cane crushed	tonnes	1437182	RT8C
Average Crushing	tcd	7657	Calculated
Average crushing per hour	tph	319	
Exhaust Steam Requirement on cane		46%	
Live steam for process (on cane)		2%	
Total steam requirement	tph	153	
Steam to bagasse		1.73	
Bagasse requirement	tph	89	
Bagasse on cane		34.07%	RT8C
Bagasse generated	tph	109	
Bagasse consumed in Mill stopages and	tph	6.08	

bagacillo		
Bagasse saving after season	tph	14.10

Factory in 2007-2008			Source
Days of operation		135.7	RT8C
Cane crushed	Tonnes	1057065	RT8C
Average crushing	Tcd	7790	Calculated
Average Crushing	Tph	325	
Exhaust Steam Requirement on cane		44%	
Live steam for process (on cane)		2%	
Total steam requirement	Tph	149	
Steam to bagasse		1.73	
Bagasse requirement	Tph	86	
Bagasse on cane	%	32.83%	RT8C
Bagasse generated	Tph	107	
Bagasse consumed in Mill stopages and bagacillo	Tph	8.33	
Bagasse saving after season	Tph	11.92	

Project Scenario		
Days of operation (season)		180
Crushing capacity	tcd	10,000
Average Crushing	tph	416.67
Exhaust Steam Requirement on cane	tph	44%
Live steam for process (on cane)		2%
Total steam requirement		191.67
Steam to bagasse		2.25
Bagasse requirement		85.19
Bagasse on cane	%	30
Bagasse generated	tph	125
Bagasse consumed in Mill stopages and bagacillo	tph	8.33
Bagasse saving	tph	31.48

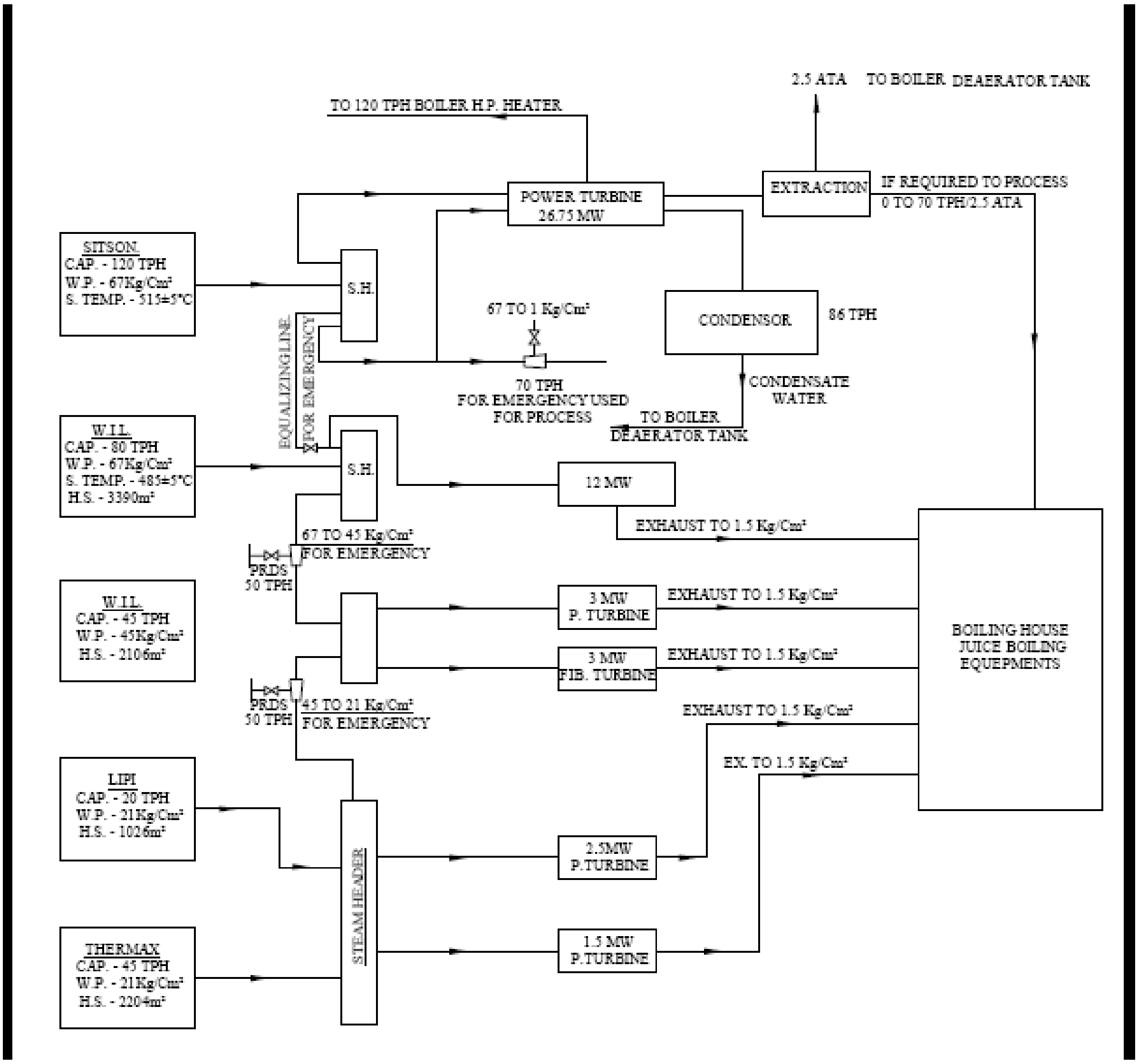
Life time [24]details on existing equipments

Boiler	Commissioning
45tph - Thermax	1991
45tph - WIL	2001
20tph - Lippi	1998
80tph - WIL	2005

Turbines	Commissioning
2.5MW - Bellis	1991
1.5MW - BHEL	2004
12MW - Triveni	2005
3MW - Triveni	2006

[24] The lifetime of the equipment is 20 years; however, they will exceed the crediting periods even after renewal (7*3 = 21 years) since they operate at load factors of 90% for 230 days.

Single line diagram for power and heat plant and project activity



Annex 4

MONITORING INFORMATION

In addition to the measures for monitoring listed in section B 7.2 the following systems will be put in place to monitor the project activity.

In terms of the storage of data logbooks will be kept for the generation of power. As outlined the environmental monitoring will be undertaken by qualified independent third party agencies and records of these reports will be kept on site along with the necessary consents from the Uttar Pradesh Pollution Control Board.

All meters will be calibrated annually by an accredited independent third party. The calibration records will be maintained on site.

The Power Plant Manager will be responsible for the collection and storage of the electrical data, supported by the shift engineers and the switchboard attendants. The Chief chemist will be responsible for the environmental testing and measurement of the other parameters required.

The archiving and preservation of records will be in paper and electronic form and these will be held for a minimum of two years after the crediting period.

The monitoring of the project activity will be the responsibility of the President of the sugar factory. The monitored data will be reported to Agrinergy on a monthly basis for the calculation and estimation of emission reductions. This data will be checked against initial estimates and a summary report will be provided quarterly by Agrinergy. If the project is not performing as expected, on the basis of the monthly data, a report will be sent to LH Sugars outlining where the project is deviating in its generation of emission reductions. Should there be significant changes to the set-up or operation of the plant these will be notified to Agrinergy and amendments to the PDD will be requested through a DOE.

At the end of each year of operation Agrinergy will prepare a monitoring report that will be submitted to a DOE for verification, however visits to the site may be undertaken by Agrinergy during the first year to check that the procedures and monitoring plan are being followed.

The registration of the project activity will be the responsibility of Mr Dixit but assistance will be provided by Agrinergy.

Emergency situations
In terms of emergency preparedness the main risk is risk of fire. A fire fighting system will be installed at the site, comprising fire hydrants and fire extinguishers. The fire hydrants and extinguishers will be tested in line with the manufacturer's guidelines.

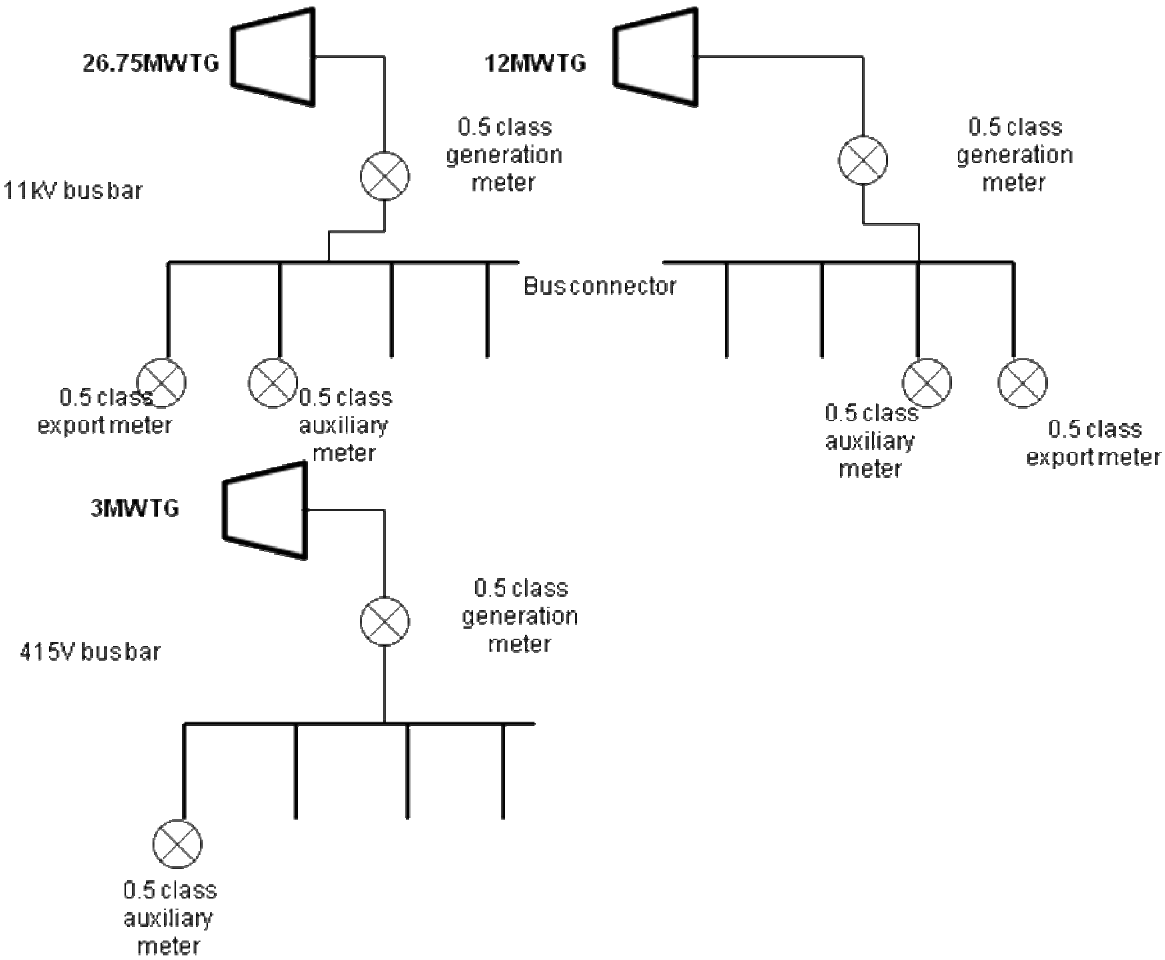
Training
Complete training for the operation of the boiler and turbine and their auxiliaries will be provided at the time of commissioning by the manufacturer. A complete set of documentation will be provided to support this training and the on-going operation and maintenance of the equipment. Additional training

will be provided to the operators and it is expected that they will gain additional recognised technical qualifications through this training.

Annex 5

METERING INFORMATION

The following diagram shows the metering points on the power and heat plant. This has been simplified from the single line diagram for the entire power and heat plant that has been submitted to the validation team.



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