



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

CONTENTS

- A. General description of project activity
- B. Application of a baseline and monitoring methodology
- C. Duration of the project activity / crediting period
- D. Environmental impacts
- E. Stakeholders' comments

Annexes

- Annex 1: Contact information on participants in the project activity
- Annex 2: Information regarding public funding
- Annex 3: Baseline information
- Annex 4: Monitoring plan

**SECTION A. General description of project activity****A.1 Title of the project activity:**

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Power capacity expansion project at Dwarikesh Puram

Version: 05

Date: 11/10/2007

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A.2. Description of the project activity:

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Purpose

Dwarikesh Sugar Industries Limited (DSIL) proposes to increase the power generation capacity of its existing sugar manufacturing facility at Dwarikesh Puram with 7500 tonnes crushing per day (tcd), where currently there are two boilers of 60 tons per hour (tph) capacity generating steam at 45 kg/cm² pressure and 3 x 3MW back pressure turbines. The project activity consists of installation of a new Bi-drum, natural circulation, balanced draft top supported water tube bagasse fired traveling grate, spreader stoker boiler suitable for steam output capacity of 120 tons per hour (tph) at 86 kg/cm² pressure and steam temperature of 515 +/- 5° C and a 24 MW double extraction cum condensing turbine for generating power along with all other accessories and equipments. The bagasse generation from sugarcane crushing is around 32% of the sugarcane crushed by weight. Thus the daily bagasse generation capacity of the sugar mill is around 2400 tonnes per day (tpd). The objective of the project activity is to maximize the utilization of available resources and to conserve the environment by generating power through bagasse coming from the sugar mill. The power getting generated from the project activity would be supplied to the Northern grid which is under severe power shortage.

Contribution to Sustainable Development***Socio-economic well being***

The project activity helps the Indian national policy on promotion of clean power. The government's clean power diversification strategy includes a multi-pronged strategy focusing on reducing wastage of energy combined with the optimum use of renewable energy (RE) sources, as adopted by the project activity. Generation of direct and indirect employment would occur due to the project activity. This employment generation will be during the construction stage and subsequently during operational stage i.e., after project commissioning. In the absence of the project activity, no such employment generation would have occurred either during the retrofitting phase or during the operational phase.

Environmental well being

The project activity substitutes, and hence decreases the future need, for primarily fossil fuel based power generation by the grid, thereby reducing carbon dioxide (CO₂) emissions and natural resource conservation.

Technological well being

The project activity is a shift of the sugar industry from the existing practice of low efficiency, medium pressure (22-45 kg/cm²), dumping grate boilers to high efficiency, high pressure (67-107 kg/cm²) and temperature, traveling grate boiler leading to technological up-gradation.

Thus the project activity contributes positively towards the sustainable development indicators stipulated by the Government of India (host country) in the interim approval guidelines for CDM projects^{1,2}.

¹ http://envfor.nic.in:80/divisions/ccd/cdm_iac.html

**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)	The Party involved wishes to be considered as project participant (Yes/No)
India (host)	Dwarikesh Sugar Industries Limited (DSIL)	No

A.4. Technical description of the project activity:**A.4.1. Location of the project activity:**

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The project activity is coming up in the premises of the DSIL manufacturing facility at Dwarikesh Puram.

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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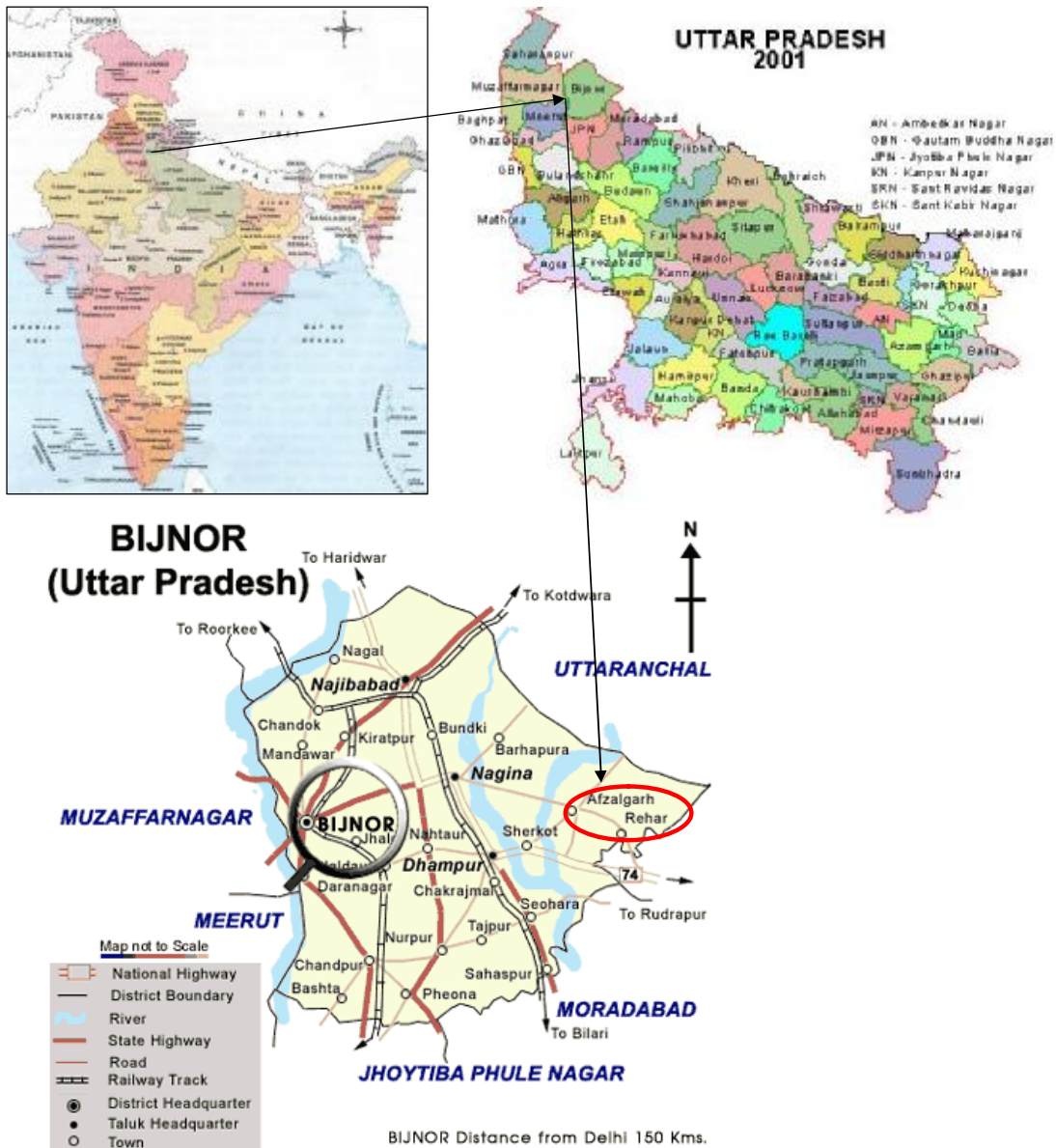
Village Bahadurpar, Tehsil Dhampur, District Bijnore

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 is located in the existing sugar manufacturing unit of DSIL – Dwarikesh Puram at Village Bahadurpar, Tehsil Dhampur, District Bijnore, Uttar Pradesh State in Northern India. The project site is well connected by road to NH 74 and the nearest railway station is at Dhampur. The coordinates of Dhampur are: Latitude: 29° 19'N, Longitude: 78° 31'E

² http://envfor.nic.in/cdm/host_approval_criteria.htm



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

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The project activity falls under the Sectoral Scope 1: Energy industries (renewable - / non-renewable sources) as per the sectoral scopes related approved methodologies and DOEs.

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

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The cogeneration project activity based on Rankine cycle consists of the following main units:

- 1 number of bagasse fired boiler
- 1 number of steam turbine
- Electrical generator
- Appropriate power evacuation system

and the related instrumentation and controls. The technical specifications of the key units are as follows:

Boiler

Type : Bi-drum, natural circulation, balanced draft, top supported water tube, bagasse fired, travelling grate, spreader stoker boiler
Steam output : 120 tons per hour
Steam pressure : 86 kg/cm²
Steam temperature : 515 +/- 5° C

Steam turbine

Type : Double extraction cum condensing (EC)
Capacity : 24 MW
Steam pressure : 86 kg/cm² (g)
Steam temperature : 515 +/- 5° C

Electrical generator

Type : Four pole, 3 phase Air cooled, Brushless excitation with digital automatic voltage regulation system
Speed : 1500 RPM
Frequency : 50 Hz
Power factor : 0.8 (lagging)
Voltage : 11 kV

The high pressure boiler and the EC turbine would ensure that maximum power output is obtained from the bagasse fired. The power getting generated in the power plant at 11 kV would be stepped up to 132 kV and supplied to the grid. The high voltage transmission would ensure that the transmission and distribution losses are minimal.

The technology for the boilers and turbines is well established and available in India and the project activity does not involve any transfer of technology. The technology being used is environmentally safe and sound.

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

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Years	Annual estimation of emission reductions in tonnes of CO ₂ e
2007 – 08	41,284
2008 – 09	41,284
2009 – 10	41,284
2010 – 11	41,284
2011 – 12	41,284
2012 – 13	41,284
2013 – 14	41,284
2014 – 15	41,284
2015 – 16	41,284
2016 – 17	41,284
Total estimated reductions (tonnes of CO ₂ e)	412,840
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO ₂ e)	41,284

A.4.5. Public funding of the project activity:

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No public funding from parties included in Annex – I of convention is involved in the project activity. Thus the project participant hereby confirms that no diversion of Official Development Assistance is caused due to the project activity.

**SECTION B. Application of a baseline methodology****B.1. Title and reference of the approved baseline methodology applied to the project activity:**

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Title: Consolidated baseline methodology for electricity generation from biomass residues

Reference – Approved consolidated baseline methodology ACM0006, Version 05, Sectoral Scope: 01.

The approved methodology also draws upon the “Tool for the demonstration and assessment of additionality (ver 3)” and the following methodology for grid emission factor calculation:

Title: “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”

Reference: UNFCCC Approved baseline methodology ACM0002 / Version 06, Sectoral Scope: 01, 19th May 2006

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

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The said methodology is applicable to biomass residue fired electricity generation project activities, including cogeneration plants.

Since the project activity is a cogeneration plant which would be supplying electricity to grid using bagasse, which is a biomass residue derived during sugarcane crushing process, thus it meets the above mentioned applicability criteria. As per the methodology, the project activity may include the following activity:

“The installation of a new biomass residue fired power plant, which replaces or is operated next to existing power plant fired with either fossil fuels or the same type of biomass residue as in the project plant (**power capacity expansion projects**)”

The project activity involves installation of new bagasse based cogeneration, which would be operated next to existing cogeneration units fired with bagasse, thereby leading to power capacity expansion. Further, the project activity meets the applicability criteria of consolidated methodology as under:

Criteria 1: No other biomass types than *biomass residues*, as defined above, are used in the project plant and these biomass residues are the predominant fuel used in the project plant (some fossil fuels may be co-fired)

The project activity uses only bagasse (*a biomass residue*) as a fuel in the boiler and usage of no other biomass types like municipal solid waste (MSW) as fuel in boiler is envisaged. The bagasse is generated in-house during the crushing of sugarcane.

Criteria 2: For projects that use biomass residues from a production process (e.g. production of sugar or wood panel boards), the implementation of the project shall not result in an increase of the processing capacity of raw input (e.g. sugar, rice, logs, etc.) or in other substantial changes (e.g. product change) in this process

Implementation of the project activity has no direct/ indirect effect on the bagasse production in the facility. The bagasse production is guided by the sugar production (sugar demand of the market). The project



activity will not result in any change in the processing capacity or product i.e., DSIL would continue to manufacture sugar using the same production process.

Criteria 3: The biomass residues used by the project facility should not be stored for more than one year.

Maximum portion of the bagasse generated during crushing season (which spans over 6 to 7 months) at the sugar plant is continuously used by the boilers for generating steam for the sugar manufacturing facility. It is a general practice for sugar mills to keep some bagasse until the beginning of the next season for the start-up of the boilers. This bagasse is always stored for less than a year: from the end of the crop in early March until end October, the start of new crop. Thus bagasse is not stored at the project facility for more than one year.

Criteria 4: No significant energy quantities, except from transportation or mechanical treatment of the biomass residues, are required to prepare the biomass residues for fuel combustion, i.e. projects that process the biomass residues prior to combustion (e.g. esterification of waste oils) or that treat waste that results from the preparation of the biomass residues (e.g. from drying the biomass mechanically) under anaerobic conditions are not eligible under this methodology.

The bagasse produced from the sugar mill is directly fired in the boiler and no fuel preparation or processing is done.

The project activity meets all the applicability criteria of the selected approved methodology and hence the methodology may be applicable to the project.

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

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As per the methodology, for the purpose of determining GHG emissions of the project activity the following emission sources are to be included:

- CO₂ emissions from on-site fossil fuel and electricity consumption that is attributable to the project activity. This includes fossil fuels co-fired in the project plant, fossil fuels used for on-site transportation or fossil fuels or electricity used for the preparation of the biomass residues, e.g., the operation of shredders or other equipment, as well as any other sources that are attributable to the project activity; and
- CO₂ emissions from off-site transportation of biomass residues that are combusted in the project plant.

There is no fossil fuel consumption in the power plant and off-site transportation is also not involved as the project activity would be utilising the bagasse available on-site. Thus there would not be any GHG emissions due to the project activity.

For the purpose of determining the baseline, the following emission sources are to be included:

- CO₂ emissions from fossil fuel fired power plants connected to the electricity system; and
- CO₂ emissions from fossil fuel based heat generation that is displaced through the project activity.

The CO₂ emissions from the fossil fuel fired power plants connected to the electricity system has been considered and since there is no displacement of fossil fuel based heat generation by the project activity so the same has been avoided.

- Where the most likely baseline scenario for the biomass residue use is that the biomass residues would be dumped or left to decay under aerobic or anaerobic conditions (cases B1 or B2) or would be burnt in an uncontrolled manner without utilizing it for energy purposes (case B3), project participants may decide whether to include CH₄ emissions in the project boundary.

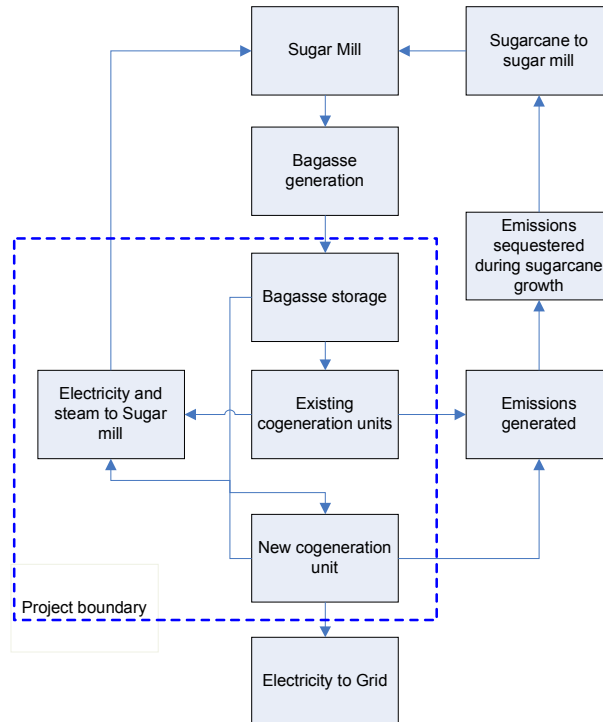


As the bagasse is not dumped or left to decay or burned in an uncontrolled manner without utilizing it for energy purposes so CH_4 emissions arising due to the same are not involved in the project and baseline emissions.

The **spatial extent** of the project boundary includes the power plant at the project site and all power plants connected physically to the electricity system to which the project activity is supplying power. Further guidance on the spatial extent of the project electricity system, including issues related to the calculation of the build margin (BM) and operating margin (OM), has been taken from “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” (ACM0002).

Project Site

Project activity boundary covers bagasse fuel storage, power plant (Auxiliary units, boilers and turbines). The project activity uses bagasse generated from its Mill. Flow chart and project boundary is illustrated in the following Figure:



Connected (Project) electricity system - Power plants connected to the electricity system

For the purpose of determining the Built Margin (BM) and operating margin (OM) emission factor, a connected electricity system is defined as an electricity system that is connected by transmission lines to the project electricity system and in which power plants that can be dispatched without significant transmission constraints.



Indian power grid system is divided into five regions namely Northern, North Eastern, Eastern, and Southern and Western Regions. The Northern Region consists of Delhi, Himachal Pradesh, Punjab, Uttar Pradesh, Haryana, Jammu & Kashmir, Rajasthan and Uttaranchal State. The project activity is connected to the Uttar Pradesh grid which is a part of Northern regional grid, so Northern regional grid has been taken as the default choice for the project activity for calculation of baseline emission factors.

The description of sources included in the project boundary is summarised in the following table:

	Source	Gas		Justification / Explanation
Baseline	Grid electricity generation	CO ₂	Included	Main emission source
		CH ₄	Excluded	Excluded for simplification. This is conservative.
		N ₂ O	Excluded	Excluded for simplification. This is conservative.
	Heat generation	CO ₂	Included	Main emission source
		CH ₄	Excluded	Excluded for simplification. This is conservative.
		N ₂ O	Excluded	Excluded for simplification. This is conservative.
	Uncontrolled burning or decay of surplus biomass residues	CO ₂	Excluded	It is assumed that CO ₂ emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH ₄	Excluded	This is excluded as there is no uncontrolled burning or decay of bagasse and the bagasse will be utilized for the production of heat.
		N ₂ O	Excluded	Excluded for simplification. This is conservative. Note also that emissions from natural decay of biomass are not included in GHG inventories as anthropogenic sources.
Project Activity	On-site fossil fuel and electricity consumption due to the project activity (stationary or mobile)	CO ₂	Included	May be the main emission source
		CH ₄	Excluded	Excluded for simplification. This emission source is assumed to be very small
		N ₂ O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	Off-site transportation of biomass residues	CO ₂	Included	May be the main emission source
		CH ₄	Excluded	Excluded for simplification. This emission source is assumed to be very small
		N ₂ O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	Combustion of Biomass residues for electricity and / or heat generation	CO ₂	Excluded	It is assumed that CO ₂ emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector.
		CH ₄	Excluded	This emission source must be included if CH ₄ emissions from uncontrolled burning or decay of biomass in the baseline scenario are included.
		N ₂ O	Excluded	Excluded for simplification. This emission source is assumed to be very small.



	Storage of biomass residues	CO ₂	Excluded	It is assumed that CO ₂ emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH ₄	Excluded	Excluded for simplification. Since biomass residues are stored for not longer than one year, this emission source is assumed to be small.
		N ₂ O	Excluded	Excluded for simplification. This emissions source is assumed to be very small.

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

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Identification of the baseline scenario:

As per the methodology identification of the most plausible baseline scenario among all realistic and credible alternatives(s) is to be carried out. The “tool for the determination and assessment of additionality” should be used to assess which of these alternatives should be excluded from further consideration (e.g. alternatives where barriers are prohibitive or which are clearly economically unattractive). Where more than one credible and plausible alternative remains, as a conservative assumption, the alternative baseline scenario would be the one that results in the lowest baseline emissions as the most likely baseline scenario.

As per the methodology, realistic and credible alternatives should be separately determined regarding:

- How **power** would be generated in the absence of the CDM project activity;
- What would happen to the **biomass residues** in the absence of the project activity; and
- In case of cogeneration projects: how the **heat** would be generated in the absence of the project activity

For **power** generation, the realistic and credible alternatives may include:

<i>Baseline scenario for power generation</i>	<i>Description</i>	<i>Comments</i>
P1	The proposed project activity not undertaken as a CDM project activity	This is one of the alternative scenario
P2	The continuation of power generation in an existing biomass residue fired power 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	In the absence of the project activity, new biomass residue fired plants would have been installed with lower efficiency of electricity generation. Thus this is not a credible baseline alternative.
P3	The generation of power in an existing captive power plant, using only fossil fuels	Use of coal for power generation would be economically unattractive and would lead to higher baseline emissions thus it cannot be taken as a baseline scenario.
P4	The generation of power in the grid.	In absence of project activity, the equivalent power exported by project



		activity would be generated in existing and/or new grid-connected power plants. Hence, it is one of the credible baseline scenario.
P5	The (installation of a new biomass residue fired power 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.	This is a credible alternative baseline scenario alternative.
P6	The installation of a new biomass residue fired power 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.	The amount of biomass residues fired will not be higher and would remain the same. Hence this scenario is not applicable.
P7	The retrofitting of an existing biomass residue fired power, 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.	In the absence of the project activity, there would not have been retrofitting of the existing plant. New units would have been installed with less efficiency of power generation. Hence this is not an applicable scenario.
P8	The retrofitting of an existing biomass residue fired power 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.	In the absence of the project activity, there would not have been retrofitting of the existing plant. New units would have been installed with less efficiency of power generation. Hence this is not an applicable scenario.



As the proposed project activity is a **cogeneration** project so alternatives for heat generation will also have to be identified. For **heat** generation, realistic and credible alternatives may include:

Baseline scenario for power generation	Description	Comments
H1	The proposed project activity not undertaken as a CDM project activity	This is one of the alternative scenario
H2	The proposed project activity (installation of a cogeneration power plant), fired with the same type of biomass residues but with a different efficiency of heat generation (e.g. an efficiency that is common practice in the relevant industry sector)	This is one of the options available with DSIL hence, can be considered as one of the credible baseline scenario.
H3	The generation of heat in an existing captive cogeneration plant, on-site or nearby the project site, using only fossil fuels	Use of coal for heat generation would be economically unattractive and would lead to higher baseline emissions thus it cannot be taken as baseline scenario.
H4	The generation of heat in boilers using the same type of biomass residues	Installation of boilers for heat generation only, would be economically unattractive thus it cannot be taken as baseline scenario.
H5	The continuation of heat generation in an existing biomass residue fired cogeneration plant at the project site, in the same configuration, without retrofitting and fired with the same type of biomass residues as in the project activity.	The existing cogeneration plants have a long life time and are meeting the heat requirement of the sugar plant. The project activity implementation would not occur in the fixed crediting period, thus this may not be a credible baseline scenario.
H6	The generation of heat in boilers using fossil fuels	Installation of boilers for heat generation only, would be economically unattractive. Use of fossil fuels in these boilers would make it further economically unattractive. Also it would lead to higher baseline emissions and hence, thus is not a credible baseline scenario.
H7	The use of heat from external sources, such as district heat	There is no district heating system in the region hence cannot be taken as baseline scenario.
H8	Other heat generation technologies	Installation of technologies for heat generation only, would be economically unattractive hence cannot be taken as baseline scenario.

For the use of biomass residues, the realistic and credible alternative(s) may include:



Baseline scenario for power generation	Description	Comments
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.	Bagasse generated by sugar mills in the region is a useful resource and is not dumped or left to decay.. Hence, it cannot be taken as baseline scenario.
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 that are stock-piled or left to decay on fields.	Bagasse generated by sugar mills in the region is a useful resource and is not dumped or left to decay.. Hence, it cannot be taken as baseline scenario.
B3	The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes.	The Bagasse, as mentioned being a useful resource is not burnt in an uncontrolled manner and is utilised for energy purposes in sugar mills. Hence this cannot be taken as a baseline scenario.
B4	The biomass residues are used for heat and/or electricity generation at the project site	In absence of project activity, biomass would have been used for heat and electricity generation in a cogeneration system with lower efficiency than project plant. Hence, can be considered as one of the credible baseline scenario.
B5	The biomass residues are used for power generation, including cogeneration, in other existing or new grid-connected power plants	To meet its electricity and heat requirements, DSIL would have used the biomass at site in a new cogeneration system with lower efficiency than project plant. Hence these cannot be considered as credible baseline scenario.
B6	The biomass residues are used for heat generation in other existing or new boilers at other sites	
B7	The biomass residues are used for other energy purposes, such as the generation of biofuels	
B8	The biomass residues are used for non-energy purposes e.g. as fertilizer or as feedstock in processes (e.g. in the pulp and paper industry)	

The identified baseline scenario is:

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Power – P1, P4 and P5

Heat – H1 and H2

Biomass – B4

The alternatives P1 and H1 face barriers as depicted in the subsequent section. Thus from the above alternative forms the applicable baseline scenario corresponds to the specific combination of baseline scenario as defined for scenario 13, which states that:

“The project activity involves the installation of a new biomass residue fired power plant, which is operated next to (an) existing biomass residue fired power plant(s). The existing plant(s) is only fired with biomass residues and continues to operate after the installation of the new power plant. In the absence of the project activity, a new biomass residue fired power plant (in the following referred to as “reference plant”) would be installed instead of the project activity at the same site and with the same thermal firing capacity but with a lower efficiency of electricity generation as the project plant (e.g. by using of a low-pressure boiler instead of a high-pressure boiler). The reference plant in context of the proposed project activity is the one with 45 kg/cm² pressure configuration with similar thermal firing capacity as the project plant but lower efficiency. The same type and quantity of biomass residues as in the project plant would be used in the reference plant. Consequently, the power generated by the project plant would in the absence of the project activity be generated (a) in the reference plant and – since power generation is larger in the project plant than in the reference plant – (b) partly in power plants in the grid. In case of cogeneration projects, the following conditions apply: the reference plant would also be a cogeneration plant; the heat generated by the project plant would in the absence of the project activity be generated in the reference plant; the efficiency of heat generation in the project plant is smaller or the same compared to the reference plant.”

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): >>

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The project activity would result in generation of electricity through effective utilization of bagasse getting generated during the sugar manufacturing process. The bagasse being a renewable bio-mass fuel does not add any net carbon-dioxide to the atmosphere because of the carbon recycling during growth of sugar cane. Therefore, the project activity will not lead to any CO₂ on-site emissions associated to bagasse combustion. In the absence of the project activity, the incremental amount of electricity generation would have taken place from the Northern grid mix and emission of CO₂ would have occurred due to combustion of fossil fuels like coal etc. or the incremental amount of electricity would have been produced in a new power unit with the same type of biomass residues but with a lower electrical energy efficiency. Thus the project activity would help in reduction of combined margin carbon intensity of the grid. Considering the export of clean electricity to the fossil fuel dominated grid by the project activity there will be continuous GHG reductions, as it would avoid equivalent GHG emissions.

In accordance with the methodology, selection of most plausible baseline scenario and demonstration of additionality is being done using the latest approved version of the Combined tool to identify the baseline scenario and demonstrate additionality as follows:

Step 1: Identification of alternatives scenarios

Sub-step 1a. Define alternative scenarios to the proposed CDM project activity;

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



Please refer section B.4 for the definitions of alternatives to the project activity. All the alternatives listed in the section are permissible in the current India Laws.

Step 2: Barrier analysis

The project additionality has been established by conducting the Barrier Analysis.

Sub-step 2a. Identify barriers that would prevent the implementation of alternative scenarios

The project activity scenarios i.e., P1 and H1 have associated barriers to successful implementation. These barriers are detailed below:

Investment barriers:

- For alternatives undertaken and operated by private entities: Similar activities have only been implemented with grants or other non-commercial finance terms. Similar activities are defined as activities that rely on a broadly similar technology or practices, are of a similar scale, take place in a comparable environment with respect to regulatory framework.

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Similar such activities of installation of high pressure cogeneration system (67 or 86 kg/cm²) have been implemented after taking CDM revenues into consideration. Projects implemented so far with similar technology are as follows:

- (i) Balrampur Chini Mills Limited at 2 locations - Balrampur and Haidergarh
- (ii) Triveni Sugar at 2 locations - Deoband and Khatauli
- (iii) Upperganges Sugar Limited Seohara
- (iv) Mawana Sugar Ltd at 3 locations – Mawana, Nanglamal and Titawi
- (v) Ramgarh Chini Mills, Sitapur
- (vi) Dalmia sugars, Sitapur. The other projects with cogeneration system are:
- (vii) L.H. Sugar works, Pilibhit
- (viii) Ajbapur sugar complex, Lakhimpur Kheri

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- No private capital is available from domestic or international capital markets due to real or perceived risks associated with investment in the country where the proposed CDM project activity is to be implemented, as demonstrated by the credit rating of the country or other country investments reports of reputed origin.

As per the Commission for Agricultural Costs and Prices (CACP), Ministry of Agriculture, Government of India, there exists a tremendous potential for bagasse based cogeneration in India, but due to the high capital cost required in setting up a high pressure cogen unit (which is equivalent to setting up a modern sugar mill) and the high interest cost of capital makes the cogeneration less attractive for sugar mills. Thus the lending institutions are reluctant and unwilling to finance such cogeneration projects (Point 25, Report on price policy for sugarcane for the season 2004-05, <http://dacnet.nic.in/cacp/sugar-final.htm>).

The funding for the project activity has been obtained from Punjab National Bank (PNB) and Indian Renewable Energy Development Agency (IREDA). This funding has been obtained after taking CDM revenues into consideration in the proposals submitted to the lending institutions. This is evident by the fact that the contract with IREDA categorically mentions that a Trust and Retention Account (TRA) has to be



opened by the borrower for servicing the repayment to IREDA and all the CDM revenues are to be routed through the TRA. The extract of the Loan agreement between DSIL and IREDA is being submitted.

Technological barriers:

- Skilled and/or properly trained labour to operate and maintain the technology is not available, which leads to an unacceptably high risk of equipment disrepair and malfunctioning or other underperformance;

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As per an article in Cane Cogen India, a quarterly newsletter published by Winrock International India, on sugar mill cogeneration which is sponsored by the Ministry of New and Renewable Energy (MNRE), Government of India, there is still very limited experience and lack of technical awareness with high pressure cogeneration systems, leading to uncertainties with regards to operation, performance, as well as lack of trained personnel (Page 14, Vol 28, Oct-Dec 2006, http://www.winrockindia.org/newsletter_pdf/Cane_Cogen_India-Vol28_Dec06.pdf)

Conventionally the cogeneration systems operating in the sugar industry are of low pressure configuration and are operated either manually or through Programmable Logic Control (PLC) based system. The project activity – high pressure cogeneration system is Distributed Control System (DCS) based. Trained people to operate such high pressure system in sugar industry are not available. This is also due to the fact that the sugar industry is seasonal in nature and does not operate through out the year. The lack of manpower availability for operating such DCS based system is evident from the fact that DSIL had given an advertisement in the newspaper for recruitment of officer for boiler operations on 14th February 2007 and there had been no satisfactory response, therefore subsequently another advertisement was released on 19th September 2007 for the vacant position.

Barriers due to prevailing practice:

Most of the sugar industries operating in the region continue to use low or medium pressure boilers for co-generation purpose. Prior to the mid-1970's, the steam pressure used in the majority of boilers located in Indian sugar mills was in the range of 10-15 kg/cm², which subsequently increased to the prevailing average of 21 kg/cm². The majority of the boiler systems in Indian sugar mills operate at a pressure of 21 kg/cm² and temperature of 340 °C, although some mills employ 14 kg/cm²/265 °C or 32 kg/cm²/380 °C steam systems. In the mid-1980, a few Indian mills installed medium pressure (42 kg/cm²) boilers³, this demonstrates that usage of boilers with higher pressures (86 kg/cm²) is not being practised in the sugar industry in the region and hence is not a prevalent practice.

Other barriers:

The differences between the project activity and the conventional reference plant are as follows:

<u>S. No.</u>	<u>Description</u>	<u>Remarks</u>	<u>Documentary evidence</u>
1	Capital cost	The cost of the project activity high pressure cogen boiler (86 kg/cm ² , 120 tph) is INR 209.5 million, which is more than twice the cost of similar capacity (reference plant) boilers (45	Purchase contract for the project activity boiler and the reference plant boiler

³ Page 7 of 25 of the report "Promotion of Biomass Cogeneration with Power Export in the Indian Sugar Industry" http://www.netl.doe.gov/publications/carbon_seq/articles/india.pdf



		<u>kg/cm², 2x60 tph). The cost of the reference plant boilers comes to around INR 99.0 million</u>	
<u>2</u>	<u>Automation</u>	<u>The project activity requires Distributed Control System (DCS), whereas the reference plant system is usually operated through a programmable Logic Control (PLC) system. The latter being the conventional practice. Getting people to operate such DCS based projects in the seasonally functional sugar industry is difficult.</u>	<u>Purchase contract for the project activity automation and the reference plant automation.</u> <u>Advertisement placed in the newspapers for appointment of people to operate such systems.</u>
<u>3</u>	<u>Maintenance cost</u>	<u>Since the project activity system is of high pressure, high temperature so the spares are relatively costly as compared to the reference plant system.</u>	

These differences prevent the implementation of the project activity. Further to the said differences the institutional barriers that the project activity faces are much more as compared to the alternative. These barriers are owing to the export of power as per the power purchase agreement that the project has with state nodal agency, Uttar Pradesh Power Corporation Limited (UPPCL).

(i) DSIL has signed Power Purchase Agreement (PPA) with UPPCL. Project earnings are dependent on the payment from UPPCL against the sale of electricity to the grid. It is known that the financial condition of electricity boards in India was not very healthy in the recent past. As per the data available till 2003-04, UPPCL was incurring heavy technical and commercial losses. The aggregate technical and commercial loss for UPPCL (off-taker) in the year 2003-04 was INR 32.82 billion⁴. Although the fiscal condition of state electricity board has improved considerably in present year, dealing with UPPCL has associated risks.

Also UPPCL is purchasing power at an average rate of INR 1.66/kWh from various sources. However, the purchase of power from cogeneration projects has been fixed as INR 2.84/kWh by UPERC, which is much higher than average cost at which UPPCL purchases power. Hence, likelihood of the PPA being renegotiated at later stage cannot be ruled out in the future.

(ii) Till 2004-05 the rate of purchase of power by UPPCL from similar projects was INR 2.25/kWh for base year 1999-2000 with annual escalation of 5 %. This would have made the tariff as INR 3.16/kWh in the year 2006-2007, however DSIL would sell power at INR 2.98 with annual escalation of INR 0.04/kWh only, as per the recent order by UPERC. Also the validity of the power purchase rate has been kept only for a period of 5 years⁵ but since the power plant will be commissioned in 2007, the purchase rate is certain only for four years after being commissioned. Hence, possibility of further reduction in rate of power purchase after 4 years cannot be ruled out.

⁴ UPERC, Tariff Order 2004-2005

⁵ [http://www.uperc.org/final%20review%20order%20dated%2015.9.05%20\(SUO-MOTO\).pdf](http://www.uperc.org/final%20review%20order%20dated%2015.9.05%20(SUO-MOTO).pdf)

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(iii) As per the policy that existed till year 2004-05, UPPCL and DSIL would have shared the cost of transmission lines on equal basis. However, as per the recent orders by UPERC, DSIL is required to bear the entire cost for laying the transmission lines from project plant to sub-station.

(iv) Section 86 (1) (e) of the Electricity Act 2003 states that State Regulatory Commissions should promote and fix quantity of energy to be purchased from renewable and non-conventional energy (NCE) projects by state electricity boards. NEDA, the Nodal agency for promotion of NCE projects in Uttar Pradesh, has recommended that it should be made obligatory to procure 10% of total power consumption from Renewable and NCE source based plants. Going against this policy, UPERC kept this limit to 5 %. Uttar Pradesh Sugar Mills cogeneration association filed a petition with UPERC requesting it to increase this limit to 10 % in line with Electricity Act 2003. Taking view from the petitioners, UPERC revised the limit from 5 % to 7.5 %⁶. UPERC may in future reduce this limit again, whereby DSIL might have to reduce its export to the grid. These revisions are bound to severely affect the sustainability of the project activity. If this scenario continues, then it would significantly affect the development of other such projects due to reluctance of the financial institutions to support them and would hamper the growth of eco-friendly non-emissive power generation in the state.

The following sets of documents are being submitted as proofs to substantiate these barriers:

- (i) Non-payment by UPPCL: DSIL has been exporting power through its Dwarikesh Nagar plant to UPPCL. UPPCL has till date not paid the escalation amount dues as per the PPA for the years 2003-04, 2004-05 and 2005-06 for the power evacuated by DSIL. The correspondences to the same effect from DSIL to UPPCL are being submitted.
- (ii) Lack of maintenance of transmission line: The transmission line required for power evacuation is laid down by UPPCL on the cost of DSIL. To maintain the transmission line, as per the PPA, UPPCL deducts 1.5% amount of the total cost of the line from the bill. Despite these deductions there has been no proper maintenance of the transmission line leading to frequent tripping problems and thereby financial losses. To this effect the correspondence from DSIL with UPPCL are being submitted.
- (iii) Low tariffs: UPPCL is the sole agency responsible for transmission and distribution of electricity in the state of Uttar Pradesh. The tariffs of UPPCL are much below than the rates offered by other parties. The correspondence to this effect from Tata Power Trading Company Limited (TPTCL) is being submitted.

The above stated barriers are not applicable to the scenario P4 and P5 since it entails power generation from grid based power plants and lower efficiency power plants which would not result in significant power generation and thereby insignificant or no export to the grid.

This clearly proves that in absence of CDM, installation of high pressure configurations cogeneration systems would have not been implemented in the region.

Sub-step 2b. Eliminate alternative scenarios which are prevented by the identified barriers

⁶ [http://www.uperc.org/final%20review%20order%20dated%2015.9.05%20\(SUO-MOTO\).pdf](http://www.uperc.org/final%20review%20order%20dated%2015.9.05%20(SUO-MOTO).pdf)

¹⁶ <http://www.uperc.org/Copy%20of%20Order%20-UPERC%20NCE%20Policy%20FINAL%20DT.18-7-2005.pdf>

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Deleted: Barriers due to prevailing practice¶

The project activity which involves implementation of high pressure boiler (86 kg/cm²) for the cogeneration project is among the first few of its kind being carried out in the region. Most of the sugar industries operating in the region continue to use low or medium pressure boilers for co-generation purpose. Prior to the mid-1970's, the steam pressure used in the majority of boilers located in Indian sugar mills was in the range of 10-15 kg/cm², which subsequently increased to the prevailing average of 21 kg/cm². The majority of the boiler systems in Indian sugar mills operate at a pressure of 21 kg/cm² and temperature of 340 °C, although some mills employ 14 kg/cm²/265 °C or 32 kg/cm²/380 °C steam systems. In the mid-1980, a few Indian mills installed medium pressure (42 kg/cm²) boilers⁷, this demonstrates that usage of boilers with higher pressures (86 kg/cm²) is not being practised in the sugar industry in the region and hence is not a prevalent practice. There are 117⁸ sugar mills in Uttar Pradesh, out of which 66 sugar mills are above 2500 TCD⁹ and as per the data provided by Indian Sugar Mills Association (ISMA) – the premier association of sugar industry in India, only 11 have cogeneration systems¹⁰. Also as per publicly available information, high pressure configuration cogeneration systems similar to the project activity have been commissioned or in the process of getting commissioned in 10 plants¹¹ (... [1])

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Moreover, Uttar Pradesh has a potential of more than 1000 MW from bagasse based cogeneration plants and the installed capacity was around 100 MW in 2004-05, which was likely to increase to 150 MW by the end of the 2005-2006. In terms of power procurement from these sources, UPPCL is currently purchasing around 170 GW (... [2])

Deleted: Other Barriers¶

Institutional Barriers: ¶

(i) DSIL has signed Power Purchase Agreement (PPA) with UPPCL. Project earnings are dependent on the payment from UPPCL against the sale of electricity to the grid. It is known that the financial condition of electricity boards in India was not very healthy in the recent past. A (... [3])



The above discussed barriers are faced by P1 and H1. The barriers to the project activity are not applicable to the other identified alternatives i.e., P4, P5, H2 and B4, as they are the prevailing practices and business as usual scenario. List of alternative scenarios to the project activity that are not prevented by any barrier are already documented in section B.4.

Step 4: Common Practice analysis:

As per the additionality tool the tests are to be complemented with an analysis of the extent to which the proposed project type (High pressure cogeneration system and export of power to grid) has already diffused in the sugar sector in the region.

This test being a credibility check to complement the barrier analysis and is to be carried out by identifying and discussing the existing common practice through the following sub-steps:

Sub-step 4a. Analyze other activities similar to the proposed project activity:

1. Providing an analysis of any other activities implemented previously or currently underway that are similar to the proposed project activity. Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc. Other CDM project activities are not to be included in this analysis. Provide documented evidence and, where relevant, quantitative information. On the basis of that analysis, describe whether and to which extent similar activities have already diffused in the relevant region.

Sub-step 4b. Discuss any similar options that are occurring:

2. If similar activities are widely observed and commonly carried out, it calls into question the claim that the proposed project activity faces barriers. Therefore, if similar activities are identified above, then it is necessary to demonstrate why the existence of these activities does not contradict the claim that the proposed project activity is subject to barriers. This can be done by comparing the proposed project activity to the other similar activities, and pointing out and explaining essential distinctions between them that explain why the similar activities did not face the barriers to which the proposed project activity is subject.

There are 117 sugar mills in the state of Uttar Pradesh and such high pressure configuration cogeneration systems (86 kg/cm²), similar to the project activity have been commissioned in only 13 plants in the region. All of these projects are at various stages of availing CDM funding. Thus they are not to be included in the analysis.

Further with respect to export of power to grid, Uttar Pradesh has a potential of more than 1000 MW from bagasse based cogeneration plants and the installed capacity was around 100 MW in 2004-05, which was likely to increase to 150 MW by the end of the 2005-2006. In terms of power procurement from these sources, UPPCL is currently purchasing around 170 GWh from cogeneration plants out of its total power consumption of around 41000 GWh, which works out to around 0.43 only%¹⁶. This substantiates the fact that practice of sale of power to grid from bagasse based cogeneration projects has not penetrated in the region.

Thus it can be concluded that similar activities are not widely observed and commonly carried out and the claim that the proposed project activity faces barriers as stated earlier is correct.

Deleted: Based on the information about activities similar to the proposed project activity, a common practice analysis is carried out to complement and reinforce the barrier analysis. As discussed earlier, high pressure configuration cogeneration systems, similar to the project activity have been commissioned in only 10 plants in the region. All of these 10 projects are in process of availing CDM funding. Therefore the DSIL project activity is not a common practice.[¶]



The registration of the project activity as a CDM project would help in mitigating the barriers. The project activity involving implementation of high pressure boiler faces an inherent risk / uncertainty of performance in the future due to lack of proven track record of operating such projects in the region. Hence the revenues from CDM will mitigate the losses due to under performance of the project activity and also as mentioned above provide a cushion against delay/non payment of electricity invoices by the UPPCL. Thus CDM registration **is essential for the project activity.**

Based on the above steps, it may be satisfactorily concluded that the DSIL project activity is not a baseline scenario and hence is clearly additional.

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

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In accordance with ACM0006, Scenario 13 is the applicable baseline scenario for the proposed project activity, which describes the following situation being applicable to the project activity:

“The project activity involves the installation of a new biomass residue fired power plant, which is operated next to (an) existing biomass residue fired power plant(s). The existing plant(s) is only fired with biomass residues and continues to operate after the installation of the new power plant. In the absence of the project activity, a new biomass residue fired power plant (in the following referred to as “reference plant”) would be installed instead of the project activity at the same site and with the same thermal firing capacity but with a lower efficiency of electricity generation as the project plant (e.g. by using of a low-pressure boiler instead of a high-pressure boiler). The reference plant in context of the proposed project activity is the one with 45 kg/cm² pressure configuration with similar thermal firing capacity as the project plant but lower efficiency. The same type and quantity of biomass residues as in the project plant would be used in the reference plant. Consequently, the power generated by the project plant would in the absence of the project activity be generated (a) in the reference plant and – since power generation is larger in the project plant than in the reference plant – (b) partly in power plants in the grid. In case of cogeneration projects, the following conditions apply: the reference plant would also be a cogeneration plant; the heat generated by the project plant would in the absence of the project activity be generated in the reference plant; the efficiency of heat generation in the project plant is smaller or the same compared to the reference plant.”

Determination of project emissions:

According to the methodology, Project emissions include CO₂ emissions from transportation of biomass to the project site (*PET₇*), CO₂ emissions from on-site consumption of fossil fuels due to the project activity (*PEFF₇*) and CH₄ emissions from the storage of biomass.

In the project scenario, since the project activity uses bagasse as the fuel, the project leads to no GHG on-site emissions. The GHG emission of the combustion process, mainly CO₂, is sequestered during the growth of sugarcane.

[a] Project Emissions associated with fossil fuel combustion

As there is no fossil fuel combustion associated with the project activity, hence there are no project emissions associated to fossil fuel combustion due to project activity implementation.

[b] Project Emissions associated with transport of bagasse fuel

Deleted: and encourage other entities in similar nature of work to pursue such kind of initiatives.

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Deleted: Also it might trigger other sugar industries to look into their processes and identify opportunities of power capacity expansion through better utilisation of the available bagasse.

Deleted: would result in reducing GHG emissions and promoting new and cleaner technology.

Deleted: The likely non-project scenario would be equivalent electricity generation from the grid.



The bagasse to be used as the feedstock for project activity is supplied by the sugar mill itself; no transportation of bagasse is involved. Hence there are no emissions due to transportation of bagasse.

[c] Project Emissions associated with the storage of bagasse fuel

The net increase of methane emissions associated with the storage of bagasse fuel is regarded as negligible if the bagasse is not stored for more than one year. The bagasse utilized for the project activity is stored in open piles for not more than one year. Therefore there would be no project emissions associated with the storage of bagasse fuel.

Determination of baseline emission:

The baseline emissions would be due to equivalent electricity generation from the grid. The baseline emission factor for displaced electricity has been calculated in accordance with ACM0002/Version 06 (19th May 2006). The combined margin has been calculated as described in the methodology taking the relevant grid definitions and emission factors. Please refer annex 3 for the details in determining the baseline emissions.

Estimation of emission reductions:

The project activity mainly reduces CO₂ emissions through substitution of power and heat generation with fossil fuels by energy generation with biomass residues. The emission reduction ER_y by the project activity during a given year y is the difference between the emission reductions through substitution of electricity generation with fossil fuels ($ER_{electricity,y}$), the emission reductions through substitution of heat generation with fossil fuels ($ER_{heat,y}$), project emissions (PE_y), emissions due to leakage (L_y) and, where this emission source is included in the project boundary and relevant, baseline emissions due to the natural decay or burning of anthropogenic sources of biomass residues ($BE_{biomass,y}$), as follows:

Formula used for estimation of the total net emission reductions due to the project activity during a given year y is as under.

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

Where

ER_y	are the emissions reductions of the project activity during the year y in tons of CO ₂ ,
$ER_{electricity,y}$	are the emission reductions due to displacement of electricity during the year y in tons of CO ₂ ,
$ER_{heat,y}$	are the emission reductions due to displacement of heat during the year y in tons of CO ₂ ,
$BE_{biomass,y}$	are the baseline emissions due to natural decay or burning of anthropogenic sources of biomass during the year y in tons of CO ₂ equivalents,
PE_y	are the project emissions during the year y in tons of CO ₂ , and
L_y	are the leakage emissions during the year y in tons of CO ₂ .

Emission reductions due to the displacement of electricity

Emission reductions due to the displacement of electricity are calculated by multiplying the net quantity of increased electricity generated with biomass as a result of the project activity (EG_y) with the CO₂ baseline emission factor for the electricity displaced due to the project ($EF_{electricity,y}$), as follows:

$$ER_{electricity,y} = EG_y \times EF_{electricity,y}$$

Where,



$ER_{\text{electricity}, y}$ - are the emission reductions due to displacement of electricity during the year y in tons of CO₂,
 EG_y - is the net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y in MWh,
 $EF_{\text{electricity}, y}$ - is the CO₂ emission factor for the electricity displaced due to the project activity during the year y in tons CO₂/MWh

Step 1: Determination of $EF_{\text{electricity}, y}$

The estimation of emission factor has been done as per the guidance provided in the approved methodology ACM0002. The emission factor has been taken from the Baseline Carbon Dioxide Emission Database Version 2.0 (Source: www.cea.nic.in)

Step 2: Determination of electricity generation (EG_y)

Where scenario 13 applies, EG_y is determined as follows:

$$EG_y = \min \left\{ \begin{array}{l} EG_{\text{project plant}, y} \\ EG_{\text{total}, y} - \frac{EG_{\text{historic}, 3 \text{ yr}}}{3} \end{array} \right\} - \varepsilon_{\text{el, other plant}(s)} \cdot \frac{1}{3.6} \cdot \sum_k BF_{k, y} \cdot NCV_k$$

where:

EG_y = Net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y (MWh)

$EG_{\text{project plant}, y}$ = Net quantity of electricity generated in the project plant during the year y (MWh)

$\varepsilon_{\text{el, other plant}(s)}$ = 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 (MWh_{el}/MWh_{biomass})

$EG_{\text{total}, y}$ = Net quantity of electricity generated in all power plants at the project site, generated from firing the same type(s) of biomass residues as in the project plant, including the new power plant installed as part of the project activity and any previously existing plants, during the year y (MWh/yr)

$EG_{\text{historic}, 3 \text{ yr}}$ = Net quantity of electricity generated during the most recent three years in all power plants at the project site, generated from firing the same type(s) of biomass residues as in the project plant¹⁴ (MWh)

$BF_{k, y}$ = Quantity of biomass residue type k combusted in the project plant during the year y (tons of dry matter or liter)

NCV_k = Net calorific value of the biomass residue type k (GJ/ton of dry matter or GJ/liter)

With respect to Scenario 13, $\varepsilon_{\text{el, other plant}(s)}$ corresponds to the average net efficiency of electricity generation in the “reference plant” ($\varepsilon_{\text{el, reference plant}}$) that would be installed in the absence of the CDM project activity.

Emission reductions or increases due to displacement of heat

For the applicable Scenario 13, heat and electricity would in the absence of the project activity be generated in a similar cogeneration plant but with a different configuration, i.e. the efficiency of electricity generation



is lower than in the project plant. The efficiency of heat generation, i.e. the heat generated per quantity of biomass residue fired, may differ between the project plant and the plant in the baseline scenario (the “reference plant” in case of scenarios 13).

$$\epsilon_{th, project\ plant} < \epsilon_{th, reference\ plant}$$

The above demonstration has been carried out as follows:

Description	Baseline configuration	Project configuration
Pressure (kg/cm ²)	45	86
Temperature (deg. C)	410	515
Capacity (tph)	120	120
Enthalpy in (kJ/kg)	440	440
Enthalpy out (kJ/kg)	3228	3427
Enthalpy diff. (kJ/kg)	2788	2987
NCV (kJ/kg)	17694	17694
Boiler efficiency (%)	69	70
Therefore ratio of bagasse consumption in project plant to reference plant		1.06
Ratio of thermal efficiency of project plant to reference plant		0.96

This demonstrates that the efficiency of heat generation in the project plant is smaller as compared to the reference plant. Since the additional heat is being generated by biomass therefore $ER_{heat, y} = 0$.

Baseline emissions due to natural decay or uncontrolled burning of anthropogenic sources of biomass

In the project activity scenario, the biomass would not have been left to natural decay or uncontrolled burning of anthropogenic sources of biomass. Thus in accordance with ACM0006, $BE_{Biomass} = 0$.

Leakage

As the diversion of biomass to the project activity has already been considered in the calculation of baseline reductions, leakage efforts do not need to be addressed (as per ACM0006).

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

>>

Data / Parameter:	EG _{historic}
Data unit:	GWh
Description:	Average of net quantity of electricity generated during the most recent years in all power plants at the project site, generated from firing the same type(s) of biomass residues as in the project plant
Source of data used:	Plant records
Value applied:	22.2
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data for generation has been historically measured by energy meters situated on the site along with the power plant auxiliaries. 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:	

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Data / Parameter:	$EF_{grid,y}$
Data unit:	tCO ₂ /MWh
Description:	CO ₂ emission factor for grid electricity during the year y
Source of data used:	Baseline Carbon Dioxide Emission Database Version 2.0 (www.cea.nic.in)
Value applied:	0.80
Justification of the choice of data or description of measurement methods and procedures actually applied :	The combined margin emission factor of the grid has been calculated as per the guidance provided in approved methodology ACM0002. Operating margin, OM = 0.99 tCO ₂ /MWh Build margin, BM = 0.60 tCO ₂ /MWh
Any comment:	-

Data / Parameter:	$\epsilon_{el, reference plant, y}$
Data unit:	-
Description:	Average net energy efficiency of power generation in the reference power plant that would use the biomass residues fired in the project plant in the absence of the project activity
Source of data used:	Calculated from consumption of biomass and power generation in the reference plant (45 kg/cm ²).
Value applied:	0.0945
Justification of the choice of data or description of measurement methods and procedures actually applied :	Based on the total quantity of biomass consumed and the power generated. The reference plant has been taken as the project participants own plant at Dwarikesh Nagar which has low configuration boilers. The common practice in Indian Sugar Industry is operation of low pressure boilers upto 35 kg/cm ² . Dwarikesh is operating a 45 kg/cm ² pressure cogeneration system at the sugar mill, which has been taken as the baseline scenario. This approach is deemed conservative.
Any comment:	Check consistency with manufacturer's information or the efficiency of comparable plants.

B.6.3 Ex-ante calculation of emission reductions:

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Emission reductions due to the displacement of electricity

Emission reductions due to the displacement of electricity are calculated by multiplying the net quantity of increased electricity generated with biomass as a result of the project activity (EG_y) with the CO₂ baseline emission factor for the electricity displaced due to the project ($EF_{electricity,y}$), as follows:

$$ER_{electricity,y} = EG_y \times EF_{electricity,y}$$

Emission Factor of the Grid (EF_{Grid})

The emission factor of Northern grid is 0.80 tCO₂/MWh

EG_y (Net quantity of increased electricity generation):

It is calculated as follows



$$EG_y = \min \left\{ \begin{array}{l} EG_{\text{project plant}, y} \\ EG_{\text{total}, y} - \frac{EG_{\text{historic}, 3 \text{ yr}}}{3} \end{array} \right\} - \varepsilon_{\text{el, other plant}(x)} \cdot \frac{1}{3.6} \cdot \sum_k BF_{k,y} \cdot NCV_k$$

	Units	
$EG_{\text{project plant}, y}$	GWh	93.312
$EG_{\text{total}, y}$	GWh	118.584
EG_{historic}	GWh	22.2
$\varepsilon_{\text{el, reference plant}(s)}$	MWh _{el} /MWh _{biomass}	0.0945
$BF_{k,y}$	tonnes	90,000
NCV_k	MWh per tonne of bagasse	4.92
EG_y	GWh	51.60

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

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Year	Estimation of Project activity emissions (tonnes of CO ₂ e)	Estimation of Baseline emissions (tonnes of CO ₂ e)	Estimation of Leakage (tonnes of CO ₂ e)	Estimation of overall emission reductions (tonnes of CO ₂ e)
2007-2008	0	41,284	0	41,284
2008-2009	0	41,284	0	41,284
2009-2010	0	41,284	0	41,284
2010-2011	0	41,284	0	41,284
2011-2012	0	41,284	0	41,284
2012-2013	0	41,284	0	41,284
2013-2014	0	41,284	0	41,284
2014-2015	0	41,284	0	41,284
2015-2016	0	41,284	0	41,284
2016-2017	0	41,284	0	41,284
TOTAL	0	412,840	0	412,840

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

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The monitoring methodology is used in conjunction with the ‘Approved consolidated baseline methodology ACM0006’ (Consolidated baseline methodology for grid-connected electricity generation from biomass residues). The same applicability conditions as in baseline ACM0006 apply. Project activity meets the applicability criteria of the ‘Approved consolidated baseline methodology ACM0006’. (Please refer to Section B.1.1 for details).

The monitoring methodology requires monitoring of the following:

- Electricity generation from the proposed project activity;
- Data needed to recalculate the operating margin emission factor, if needed, based on the choice of the method to determine the operating margin (OM), consistent with “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” (ACM0002);



- Data needed to recalculate the build margin emission factor, if needed, consistent with “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” (ACM0002);
- Data needed to calculate, if applicable, carbon dioxide emissions from fuel combustion due to co-firing fossil fuels used in the project plant or in boilers operated next to the project plant or in boilers used in the absence of the project activity;
- Where applicable, data needed to calculate methane emissions from natural decay or burning of biomass in the absence of the project activity;
- Where applicable, data needed to calculate carbon dioxide emissions from the transportation of biomass to the project plant;
- Where applicable, data needed to calculate methane emissions from the combustion of biomass in the project plant;
- Where applicable, data needed to calculate leakage effects from fossil fuel consumption outside the project boundary;

In the DSIL project activity:

- The operating margin emission factor (Simple OM based on 3 year average) and build margin emission factor (ex ante) are fixed at the start of the project activity and hence do not require recalculation;
- There is no fossil fuel being combusted in the project activity;
- Decay or uncontrolled burning of biomass does not happen in the absence of the project activity;
- No transportation of biomass is involved as on site bagasse is used in the project activity;
- Methane emissions from the combustion of biomass is not applicable; and
- There is no leakage involved in the project activity.

B.7.1 Data and parameters monitored:	
<i>(Copy this table for each data and parameter)</i>	
Data / Parameter:	EG_{project plant, y}
Data unit:	GWh
Description:	Net quantity of electricity generated in the project plant during the year y
Source of data to be used:	Metering records including onsite measurements and electricity sales receipts.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	93.312 GWh
Description of measurement methods and procedures to be applied:	The project activity will install electronic tri-vector meters/power monitoring system of accuracy class 0.5 which will permit continuous monitoring and measurement. Hourly recordings of data will be taken from energy meters and logged in the daily log books by the Switch Board attendant. The shift in-charge will sign off in the logbook at the end of every shift and the daily power generation would be signed by the power plant manager. The meters will be calibrated annually by an independent third party. The data will be archived on paper and electronically for 2 years beyond the crediting period.
QA/QC procedures to	The consistency of metered net electricity generation would be cross checked

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be applied:	with receipt of sales and the quantity of biomass fired. The meters would be calibrated regularly.
Any comment:	The power generation from the project activity has been estimated based on the following assumption: Plant load factor of 90%; Auxiliary consumption of 10%; and 200 days of operation

Data / Parameter:	EG_{total, y}
Data unit:	GWh
Description:	Net quantity of electricity generated in all power units at the project site, generated from firing the same type(s) of biomass residues as in the project plant, including the new power unit installed as part of the project activity and any previously existing units, during the year y
Source of data to be used:	Metering records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	118.584 GWh
Description of measurement methods and procedures to be applied:	Electronic tri-vector meters/power monitoring system of accuracy class 0.5 will be installed to permit continuous monitoring and measurement. Hourly recordings of data will be taken from energy meters and logged in the daily log books by the Switch Board attendant. The shift in-charge will sign off in the logbook at the end of every shift and the daily power generation would be signed by the power plant manager. The meters will be calibrated annually by an independent third party. The data will be archived on paper and electronically for 2 years beyond the crediting period.
QA/QC procedures to be applied:	The consistency of metered net electricity generation should be cross-checked with receipts from electricity sales (if available) and the quantity of fuels fired (e.g. check whether the electricity generation divided by the quantity of fuels fired results in a reasonable efficiency that is comparable to previous years).
Any comment:	The total power generation has been estimated based on the following assumption: Average sugar plant load of 6.5 MW; Plant load factor of 90% for the project activity plant and the existing plant load; Auxiliary consumption of 10%; and 200 days of operation

Data / Parameter:	BF_{k, y}
Data unit:	Tonnes
Description:	Quantity of bagasse 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	90,000

Deleted: Fuel record book



section B.5	
Description of measurement methods and procedures to be applied:	<u>Weight or volume meters will be used and adjustment for the moisture content will be carried out in order to determine the quantity of dry biomass. The quantity shall be cross-checked with the quantity of electricity (and heat) generated and any fuel purchase receipts (if available).</u> <u>The direct measurement of bagasse would be monitored by monitoring the speed of the rotary feeder. This monitoring instrument would be calibrated to give the amount of bagasse being combusted in the project activity. Also annual mass and energy balance would be carried out to cross check the biomass quantity used in the project activity. The mass balance would be on the basis of the measured quantity of sugarcane crushed, water added, mixed juice and excess bagasse and the energy balance would on the basis of steam quality and quantity generated.</u>
QA/QC procedures to be applied:	Any direct measurement with mass or volume meters at the plant site would be cross checked with an annual energy balance that is based on purchased quantities and stock changes.
Any comment:	This bagasse quantity is on dry basis

Data / Parameter:	NCV _k
Data unit:	MWh/ton
Description:	Net Calorific value of bagasse
Source of data to be used:	Calculations and laboratory reports
Value of data applied for the purpose of calculating expected emission reductions in section B.5	4.92
Description of measurement methods and procedures to be applied:	The net calorific value of bagasse is fairly constant. Annual in-house and/or external laboratory at appropriate time would be used for monitoring the calorific value of bagasse. The calorific value of bagasse is based on theoretical calculations as per E.HUGOT (Hand Book of Sugar Engg. Acceptable world wide by Sugar Industries) based on 2 % pol and 50% moisture and is as under: $\text{NCV (Kcal/kg)} = 4250 - 12 \times \text{Pol\% bagasse} - 48.5 \times \text{Moisture\%}$ $= 4250 - 12 \times 2 - 48.5 \times 0 = 4226 \text{ Kcal/kg of bagasse.}$
QA/QC procedures to be applied:	Consistency of measurements and local / national data would be checked with default values by the IPCC. If the values differ significantly from the IPCC default values, additional information or conducted measurements would be possibly collected. The accredited external laboratories would ensure that proper monitoring of the calorific value is being carried out.
Any comment:	

Deleted: Since direct bagasse measurement is difficult so the bagasse combusted in the project plant would be calculated from the heat generated and the efficiency of the project plant boiler. Net heat generation is determined as the difference of the enthalpy of the steam generated by the project cogeneration plant minus the enthalpy of the feed-water and any condensate return. The respective enthalpies are determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. The steam temperature and pressure will be considered as per the design specifications. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure. Further since the quality of steam (pressure and temperature) and feed water characteristics remains essentially the same within permissible limits as specified to operate the turbine, so the heat generation would be directly related to the steam generation. ¶
The bagasse consumption would be calculated on monthly basis.

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Data / Parameter:	Moisture content of bagasse
Data unit:	% Water content
Description:	Moisture content of bagasse
Source of data to be used:	On-site laboratory 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 in laboratories on monthly basis.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$S_{\text{project plant, y}}$
Data unit:	Tonnes
Description:	Net quantity of steam generated from firing biomass in the project plant
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	373,197
Description of measurement methods and procedures to be applied:	Continuous monitoring of steam would be carried out and totalized hourly. Steam flow meters will be venturi type meters with Nozzle Accuracy of 1 to 1.5 % Full scale division (FSD) and Transmitter accuracy 0.1% of FSD.
QA/QC procedures to be applied:	The meters used for monitoring the steam generation and other physical properties will be calibrated at regular intervals atleast once a year. The consistency of metered net steam generation should be cross-checked with the quantity of fuels fired (e.g. check whether the net heat generation divided by the quantity of fuels fired results in a reasonable thermal efficiency that is comparable to previous years)
Any comment:	This parameter is used for estimation of the bagasse consumption in the project activity plant.

Data / Parameter:	ϵ_{boiler}
Data unit:	%
Description:	Average net energy efficiency of heat generation in the boiler that would generate heat
Source of data to be used:	Use the lower value among (a) the measured efficiency and (b) manufacturer's information on the efficiency
Value of data applied for the purpose of calculating expected emission reductions in section B.5	70%

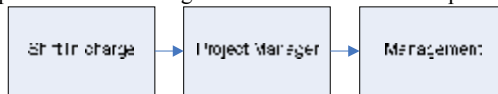


Description of measurement methods and procedures to be applied:	Use recognized standards for the measurement of the boiler efficiency, such as the “ <i>British Standard Methods for Assessing the thermal performance of boilers for steam, hot water and high temperature heat transfer fluids</i> ” (BS845). Where possible, use preferably the direct method (dividing the net heat generation by the energy content of the fuels fired during a representative time period), as it is better able to reflect average efficiencies during a representative time period compared to the indirect method (determination of fuel supply or heat generation and estimation of the losses). The efficiency of the boiler will be measured on monthly basis.
QA/QC procedures to be applied:	Check consistency with manufacturers’ information or the efficiency of comparable plants.
Any comment:	This parameter is used for estimation of the bagasse consumption in the project activity plant.

B.7.2 Description of the monitoring plan:

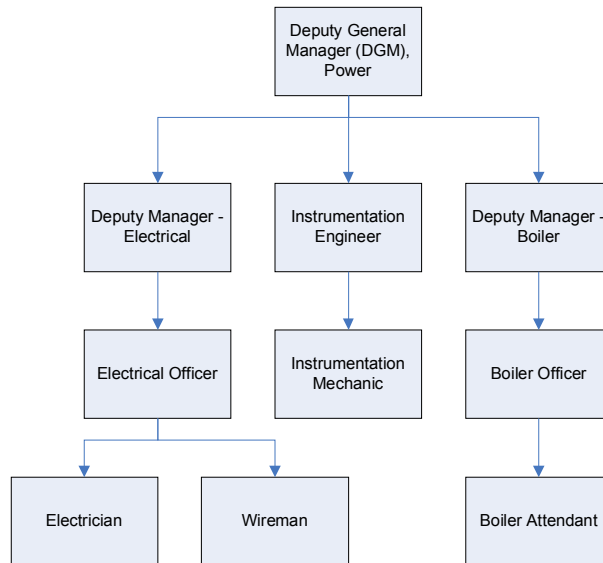
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The following operational and management structure would be implemented for the project activity:



- The shift in-charge would be assigned with the responsibility of monitoring and recording of parameters as per the monitoring plan.
- On a monthly basis, the monitoring records would be checked and discussed with project manager.
- In case of any irregularity observed, necessary action would be taken immediately.
- On monthly basis, the reports would be prepared and forwarded to the management.
- The project manager would be a qualified engineer with 10-15 years of experience in power sector and all shift in-charges would also be qualified engineers with 5-7 years of relevant experience.

The following organisation structure would be present to operate the project activity:



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)

>>

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

27/06/2007

Name of person/entity determining the baseline:

Dwarikesh Sugar Industries Limited has determined the baseline for the project activity. The entity is a project participant listed in Annex-I where the contact information has also been provided.

**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:**

>>

13/05/2006

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

>>

25 years

C.2 Choice of the crediting period and related information:**C.2.1. Renewable crediting period****C.2.1.1. Starting date of the first crediting period:**

>>

Not Selected

C.2.1.2. Length of the first crediting period:

>>

Not Selected

C.2.2. Fixed crediting period:**C.2.2.1. Starting date:**

>>

15/10/2007

C.2.2.2. Length:

>>

10 years

**SECTION D. Environmental impacts**

>>

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

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As the project activity is not listed in Schedule I of the Environmental Impact Notification S.O.60(E), dated 27/01/1994, incorporating all the amendments thus carrying out an Environmental Impact Assessment (EIA) is not mandatory for the project activity as per Indian legislation¹⁷. Moreover, the project activity complies with all environmental legislations and meets all the consent requirements (under the Water Act and Air Act) given by the State Pollution Control Board. There are no significant adverse impacts arising due to the project activity. The various environmental aspects and impacts associated with the project activity are:

S.No.	Aspect - Impact Identified	Mitigation Measures/Remarks
1.	Air Quality: The emissions will be generated on the combustion of bagasse in the boilers during operations.	Electrostatic Precipitator would be installed and flue gases shall be discharged into the atmosphere through a chimney of appropriate height.
2.	Water: There shall be no significant effect on surface water quality and hydrology.	Extensive water recycling would be carried out in the plant, no water would be discharged outside the factory and remaining treated water would be used for irrigation purpose inside the factory premises.
3.	Noise: Additional noise will be produced once the project activity is in operation stage.	Though the impact on the noise level is minimal and will be in the permissible limits, plantation will be done in and around the mill and mufflers would be distributed to the workers.
4.	Land: No additional land acquisition is required since the project activity is carried out within the premises. Ash would be generated due to the burning of bagasse.	No rehabilitation program is required. The ash would be given to the local villagers for putting in the field for top soil improvement.
5.	Socio-Economic: Implementation of the project activity would not have any adverse impact on the socio economic aspects of the life of people residing in the village in core zone.	-----
6.	Flora and Fauna: There will a negligible effect on the flora and fauna of the region due to increase in industrial and domestic activity.	-----

¹⁷ [http://envfor.nic.in/legis/eia/so-60\(e\).html](http://envfor.nic.in/legis/eia/so-60(e).html)



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:

>>

As discussed above, the project activity would not have any adverse environmental impacts. The project activity does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India. Hence EIA is not required to be undertaken by the host party.

**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 local stakeholders were identified and informed about the proposed project activity by means of individual letters briefing the nature, scope and description of the project thereby inviting them to submit comments (if any). The following stakeholders were identified:

- Local villagers and representative of village governing bodies
- Employees of DSIL
- Members of Indian Sugar Mills Association
- Members of UPPCL
- Members of UPERC
- Members of Cogeneration association of India
- Members of UP Sugar Mill association
- Members of UP Sugar Mills Cogeneration association
- Members of UP Pollution Control Board
- Members of non-conventional energy development agency of UP
- Equipment suppliers
- Ministry of Environment and Forests

Along with this an advertisement was placed on 07th September 2006 in the local news paper in vernacular language inviting comments from the local public on the project activity.

E.2. Summary of the comments received:

>>

No adverse comments have been received and the stakeholders are in favour of the project as it provides much needed power to the power deficit UP state grid increasing power availability to them.

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

>>

No adverse comments were obtained.

**Annex 1****CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

Organization:	Dwarikesh Sugar Industries Limited
Street/P.O.Box:	221, Nariman Point,
Building:	511, Maker Chambers V,
City:	Mumbai
State/Region:	Maharashtra
Postfix/ZIP:	400021
Country:	India
Telephone:	+91 22 22832468
FAX:	+91 22 22047288
E-Mail:	dsilbom@dwarikesh.com
URL:	www.dwarikesh.com
Represented by:	
Title:	Vice President (Taxation) & Company Secretary
Salutation:	Mr.
Last Name:	Maheshwari
Middle Name:	Jawarilal
First Name:	Balkishan
Department:	Taxation & Secretarial
Mobile:	+919820298477
Direct FAX:	+91 22 22047288
Direct tel:	+91 22 22042945
Personal E-Mail:	bjmaheshwari@dwarikesh.com



Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no recourse to any public funding in the proposed project activity.



Annex 3

BASELINE INFORMATION

Selection of Grid boundary

In the approved consolidated methodology ACM0002, the following guideline is given for the selection of grid. “Where DNA guidance is not available, in large countries with layered dispatch systems (e.g. state/provincial/regional /national) the regional grid definition should be used. A state/provincial grid definition may indeed in many cases be too narrow given significant electricity trade among states/provinces that might be affected, directly or indirectly, by a CDM project activity”.

As explained earlier in B.1.1, the electrical transmission system in India, is divided into five regions namely Northern Region, North Eastern Region, Eastern Region, Southern Region and Western Region. Northern region grid comprises of Delhi, Punjab, Haryana, Chandigarh, Rajasthan, Jammu & Kashmir, Uttranchal, Uttar Pradesh and Himachal Pradesh. The location of project activity is in Uttar Pradesh state which is coming under northern region. Therefore northern grid region is selected as grid boundary to estimate the baseline emission factor.

The Emission factor for Northern region grid has been taken to be **0.80 tCO₂e/MWh** as given in the Carbon Dioxide Baseline database for Indian Power Sector, version 2.0, given by CEA¹⁸ which is a statutory body under the Ministry of Power. The data base currently covers the five fiscal years 2000-01 to 2005-06. The Emission factor as per the database has been calculated in line with the approved methodology ACM0002, version 06

Estimation of efficiency of the reference plant:

The average net energy efficiency of electricity generation in the reference plant ($\epsilon_{el, \text{reference plant}, y}$) has been calculated by dividing the power generation during the previous years in a similar plant (45 kg/cm²) by the bagasse expressed in energy units, as follows:

$$\epsilon_{el, \text{reference plant}, y} = (\text{Power generated}) / (\text{NCV}_{\text{Bagasse}} * \text{Quantity of Bagasse fired})$$

Year	Power (MWh)	Bagasse quantity on dry basis (tons)	NCV on dry basis (MWh/t)	Efficiency (%)
2002-03	29,733	64,373	4.92	9.4
2003-04	25,799	55,490	4.92	9.5

¹⁸ <http://www.cea.nic.in>

**Annex 4****MONITORING INFORMATION**

The methodology requires the project-monitoring plan to consist of metering the electricity generated by the project activity, total electricity generated by all the units at site, quantity of bagasse fired in project activity, calorific value of bagasse, net quantity of heat generated by project plant and average net energy efficiency of heat generation in the boilers operated next to the project plant.

Energy meters would be used for monitoring the energy generated by all the units. All energy meters used would be electronic trivector meters of accuracy class 0.5 %. The energy meters shall be maintained in accordance with electricity standards in India. Each meter would be inspected and sealed and shall not be interfered with by anyone. All the energy meters would be tested for accuracy every half year by independent agency, which is accredited with National Accreditation Board for Testing & Calibration Laboratories, Department of Science & Technology, Govt. of India. If during half yearly test check, meters are found to be beyond permissible limits of error they would be calibrated immediately.

Calorific value of bagasse would be established every year based on test conducted by independent agency, which is accredited with National Accreditation Board for Testing & Calibration Laboratories, Department of Science & Technology, Govt. of India.

Total quantity of bagasse fired in the project plant would be measured as per the procedure given in B.7.1. The weigh bridge would be tested for accuracy every year by independent agency, which is accredited with National Accreditation Board for Testing & Calibration Laboratories, Department of Science & Technology, Govt. of India. If during yearly test check, Weigh Bridge is found to be beyond permissible limits of error it would be calibrated immediately.

Data adjustments and uncertainties: Any observations (like inconsistencies in reported parameters) and/or discrepancies in the operation of the power plant observed by any of the team member will be informed to the concerned person for necessary actions. These measures will be undertaken in order to detect and minimize the uncertainty levels in data monitoring. Furthermore, as a safety measure, the total power generating system is equipped with an 'Automatic Alarming System' which gives a prior indication of any fluctuations in the operating parameters of the power plant thereby enabling the operators to take necessary preventive measures.

Barriers due to prevailing practice

The project activity which involves implementation of high pressure boiler (86 kg/cm²) for the cogeneration project is among the first few of its kind being carried out in the region. Most of the sugar industries operating in the region continue to use low or medium pressure boilers for co-generation purpose. Prior to the mid-1970's, the steam pressure used in the majority of boilers located in Indian sugar mills was in the range of 10-15 kg/cm², which subsequently increased to the prevailing average of 21 kg/cm². The majority of the boiler systems in Indian sugar mills operate at a pressure of 21 kg/cm² and temperature of 340 °C, although some mills employ 14 kg/cm²/265 °C or 32 kg/cm²/380 °C steam systems. In the mid-1980, a few Indian mills installed medium pressure (42 kg/cm²) boilers¹, this demonstrates that usage of boilers with higher pressures (86 kg/cm²) is not being practised in the sugar industry in the region and hence is not a prevalent practice. There are 117² sugar mills in Uttar Pradesh, out of which 66 sugar mills are above 2500 TCD³ and as per the data provided by Indian Sugar Mills Association (ISMA) – the premier association of sugar industry in India, only 11 have cogeneration systems⁴. Also as per publicly available information, high pressure configuration cogeneration systems similar to the project activity have been commissioned or in the process of getting commissioned in 10 plants⁵ and all these projects are in the process of availing CDM funding.

Moreover, Uttar Pradesh has a potential of more than 1000 MW from bagasse based cogeneration plants and the installed capacity was around 100 MW in 2004-05, which was likely to increase to 150 MW by the end of the 2005-2006. In terms of power procurement from these sources, UPPCL is currently purchasing around 170 GWh from cogeneration plants out of its total power consumption of around 41000 GWh, which works out to around 0.43 only%⁶. This substantiates the fact that practice of sale of power to grid from bagasse based cogeneration projects has not penetrated in the region.

Other Barriers

Institutional Barriers:

(i) DSIL has signed Power Purchase Agreement (PPA) with UPPCL. Project earnings are dependent on the payment from UPPCL against the sale of electricity to the grid. It is known that

¹ Page 7 of 25 of the report "Promotion of Biomass Cogeneration with Power Export in the Indian Sugar Industry" http://www.netl.doe.gov/publications/carbon_seq/articles/india.pdf

² http://www.indiaainbusiness.nic.in/indian-states/uttarpradesh/Maj_Ind.htm

³ <http://www.sugartoday.com/upmills.htm>

⁴ <http://www.indiansugar.com/sugarmap/Map%20of%20UP.htm>

⁵ Projects implemented so far with similar technology (i) Balrampur Chini Mills Limited at 2 locations - Balrampur and Haidergarh (ii) Triveni Sugar at 2 locations - Deoband and Khatauli (iii) Upperganges Sugar Limited Seohara (iv) Mawana Sugar Ltd at 3 locations – Mawana, Nanglamal and Titawi (v) Ramgarh Chini Mills, Sitapur (vi) Dalmia sugars, Sitapur. The other projects with cogeneration system are: (i) L.H. Sugar works, Pilibhit (ii) Ajbapur sugar complex, Lakhimpur Kheri

⁶ <http://www.uperc.org/Copy%20of%20Order%20-UPERC%20NCE%20Policy%20FINAL%20DT.18-7-2005.pdf>

the financial condition of electricity boards in India was not very healthy in the recent past. As per the data available till 2003-04, UPPCL was incurring heavy technical and commercial losses. The aggregate technical and commercial loss for UPPCL (off-taker) in the year 2003-04 was INR 32.82 billion⁷. Although the fiscal condition of state electricity board has improved considerably in present year, dealing with UPPCL has associated risks.

Also UPPCL is purchasing power at an average rate of INR 1.66/kWh from various sources. However, the purchase of power from cogeneration projects has been fixed as INR 2.84/kWh by UPERC, which is much higher than average cost at which UPPCL purchases power. Hence, likelihood of the PPA being renegotiated at later stage cannot be ruled out in the future.

(ii) Till 2004-05 the rate of purchase of power by UPPCL from similar projects was INR 2.25/kWh for base year 1999-2000 with annual escalation of 5 %. This would have made the tariff as INR 3.16/kWh in the year 2006-2007, however DSIL would sell power at INR 2.98 with annual escalation of INR 0.04/kWh only, as per the recent order by UPERC. Also the validity of the power purchase rate has been kept only for a period of 5 years⁸ but since the power plant will be commissioned in 2007, the purchase rate is certain only for four years after being commissioned. Hence, possibility of further reduction in rate of power purchase after 4 years cannot be ruled out.

(iii) As per the policy that existed till year 2004-05, UPPCL and DSIL would have shared the cost of transmission lines on equal basis. However, as per the recent orders by UPERC, DSIL is required to bear the entire cost for laying the transmission lines from project plant to sub-station.

(iv) Section 86 (1) (e) of the Electricity Act 2003 states that State Regulatory Commissions should promote and fix quantity of energy to be purchased from renewable and non-conventional energy (NCE) projects by state electricity boards. NEDA, the Nodal agency for promotion of NCE projects in Uttar Pradesh, has recommended that it should be made obligatory to procure 10% of total power consumption from Renewable and NCE source based plants. Going against this policy, UPERC kept this limit to 5 %. Uttar Pradesh Sugar Mills cogeneration association filed a petition with UPERC requesting it to increase this limit to 10 % in line with Electricity Act 2003. Taking view from the petitioners, UPERC revised the limit from 5 % to 7.5 %⁹. UPERC may in future reduce this limit again, whereby DSIL might have to reduce its export to the grid. These revisions are bound to severely affect the sustainability of the project activity. If this scenario continues, then it would significantly affect the development of other such projects due to reluctance of the financial institutions to support them and would hamper the growth of eco-friendly non-emissive power generation in the state. In spite of these limitations, DSIL is one such entrepreneur to initiate this GHG abatement project under Clean Development Mechanism. DSIL's success would depend on securing the proposed carbon finance and it would definitely encourage other entrepreneurs to come up with similar project activities contributing further towards GHG emission reduction through the huge untapped bagasse based cogeneration potential.

⁷ UPERC, Tariff Order 2004-2005

⁸ [http://www.uperc.org/final%20review%20order%20dated%2015.9.05%20\(SUO-MOTO\).pdf](http://www.uperc.org/final%20review%20order%20dated%2015.9.05%20(SUO-MOTO).pdf)

⁹ [http://www.uperc.org/final%20review%20order%20dated%2015.9.05%20\(SUO-MOTO\).pdf](http://www.uperc.org/final%20review%20order%20dated%2015.9.05%20(SUO-MOTO).pdf)