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

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

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Dwarikesh 8 MW Bagasse-Based Power Generation Project, Bijnor, UP India
Version 2
29.11.07

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

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The Dwarikesh 8 MW Bagasse-Based Power Generation Project (hereafter, the Project) developed by Dwarikesh Sugar Industries Ltd. (hereafter referred to as the Project Developer) is a bagasse based cogeneration project in Uttar Pradesh, India. The turbine installed is an addition to the existing electricity generation capacity of 3 x 3 MW, which was used for captive consumption as well as 2 MW of grid supply. The additional electricity generated by the project would otherwise be generated through fossil fuel based thermal power plants in the grid that are present or will be built in the future.

The boilers, in existence prior to the project activity, combust bagasse – a renewable energy source and a by-product of the existing sugar factory – as fuel. Steam generated by the boilers is directed through the existing units to generate 3 x 3 MW for captive consumption and also through the new turbine to generate electricity for the grid. Although the installed capacity of the turbine is 8 MW, only 7.5 MW is exported to the grid as stated in the PPA (see section A.4.2 for details). The existing units are no longer connected to the grid and therefore all electricity is now supplied to the grid from the new unit. The proposed project activity includes only the new turbine that supplies electricity to the Uttar Pradesh State Electricity Board (UPSEB) via a 33 kV transmission line 11 km long.

The project is helping the Host Country fulfil its goals of promoting sustainable development. Specifically, the project satisfies the sustainable development guidelines provided by the Ministry of Environment and Forests in India. It also meets the recommendations from the Ministry of Non-conventional Energy Sources to help improve the quality of life and reduce poverty in the country.

Contribution to Sustainable Development

Environmental well-being
The project uses a renewable source of energy (bagasse) for electricity generation and therefore does not emit additional greenhouse gases. The project displaces electricity from the state electricity board of Uttar Pradesh thus displacing predominantly fossil fuel fired power generation. The project contributes to the sustainable development of the country by reducing the reliance of the state on fossil fuels. The by-product of using bagasse in the boilers is ash. This ash can be used as a good bio fertiliser in place of chemical fertilisers.

The proposed project activity optimises the use of natural resources by utilising agro-industrial waste towards the generation of clean and renewable energy. It diversifies the sources of electricity generation and reduces the dependence of the nation on fossil fuels. The project uses clean and efficient technologies, and conserves natural resources and also acts as a clean technology demonstration project, encouraging development of modern and more efficient generation of electricity using biomass fuel throughout the country

Socio-economic well-being

The proposed project activity increases employment opportunities in the area where the project is located specifically, jobs have been created during construction and in the area of civil works. In addition, various kinds of electro mechanical work would generate employment opportunity on a regular and permanent basis. Dwarikesh Sugar Industries Limited (DSIL) employs around 75% of its employees from the local area. Under the command area of DSIL, over 25,000 farmers are directly attached to the company as cane suppliers. DSIL provides regular trainings to farmers on better farming techniques and organizes veterinary camps to improve the health of their animals.

DSIL has a number of social welfare programs that are notable for the socioeconomic development of the area. The R. R. Morarka Public School was established in order to provide the facilities of a modern education to the children of surrounding villages. Among the students, the majority are from neighbouring villages. Since its establishment, the school has evolved into a high school with affiliation with the CBSE Board in New Delhi. The Narbada Devi Charitable Trust was launched by DSIL for the rural development of the area. Through this organization DSIL carries out various activities including transport infrastructure strengthening and the provision of sanitary facilities for villagers.

The Narbada Devi Medical Centre was established within the premises of DSIL in order to provide medical care to employees as well as local residents of the area. DSIL carries out regular health checkups of its employees and also creates health awareness for villagers through numerous medical camps. From time to time, DSIL also provides free veterinary check-ups for domestic animals owned by the villagers.

Apart from this, DSIL is active in other areas such as empowerment of women by training them in income generating activities, awareness on child labour, maternal and child health and assistance to handicapped individuals.

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)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host)	Dwarikesh Sugar Industries Ltd.	No
United Kingdom of Great Britain and Northern Ireland	EcoSecurities Group PLC	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

Further contact information of project participants is provided in Annex 1.

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

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

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A.4.1.1. Host Party(ies):

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India

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

>>
Uttar Pradesh

A.4.1.3. City/Town/Community etc:

>>
Bijnor District, P. O. Medhpura Sultan

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

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This project site is at P. O. Medhpura Sultan, Bijnor District, Uttar Pradesh. The district is located at 29.27^0 N and 78.11^0 E in the state of Uttar Pradesh which is located at 27.0^0 N and 80.0^0 E.

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

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According to Appendix B to the Simplified Modalities and Procedures for Small Scale CDM Project Activities, the proposed project falls under the following type and category.

Type I – Renewable Energy Projects

Category I.D. – Grid Connected Renewable Electricity Generation (version 10, 23 December 2006)

The proposed project activity falls under Type I since the capacity added under the project activity does not exceed 15 MW throughout the entire crediting period of the project. The project activity involves the addition of renewable generation capacity at an existing renewable power generation facility. The existing units have an aggregated installed capacity of 9 MW and are currently used only for captive consumption although prior to the implementation of the proposed project activity approximately 2 MW was supplied to the grid. After the implementation of the project activity grid supply is only from the new turbine and no longer from the old units. The capacity addition involves the installation of a new 8 MW turbine which is physically distinct - it is capable of generating electricity without the operation of existing units, and does not directly affect the mechanical, thermal, or electrical characteristics of the existing facility - but relies on the same or similar renewable resources (i.e. biomass residues). The project involves combined heat and power generation; however, only the electricity component is considered under the CDM project activity, since the new turbine uses excess steam from the boilers that existed in the baseline. The project is thus eligible under Category I.D.

Technology to be employed by the project activity

The proposed project activity involves the installation of an 8 MW extraction cum condensing turbine in order to supply electricity to the state grid. The PPA specifies that 7.5 MW of electricity is to be supplied to the grid. Therefore, there is a difference between the installed capacity of the project, which is 8 MW,

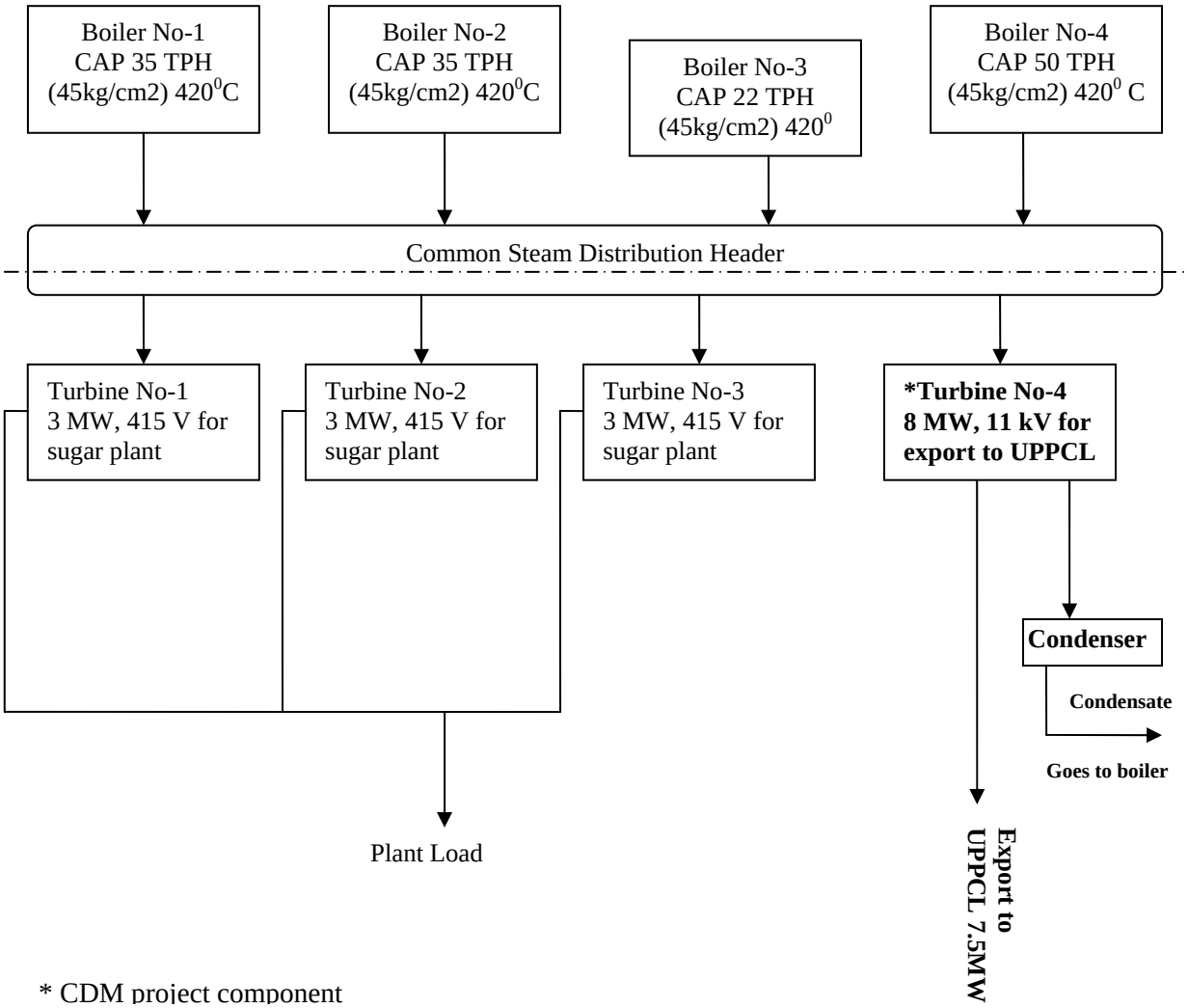
and the actual capacity that can be utilized and supplied to the grid, which is 7.5 MW. The decision for installing an 8 MW turbine was also based on the available steam surplus from the boilers.

The proposed project generates electricity from a renewable source (biomass residues) and supplies electricity to the Uttar Pradesh state grid. The sugar mill has a capacity of 6500 TCD (tonnes of cane crushed per day) and is capable of producing bagasse at the rate of 81 tonnes/hr. This bagasse is fired in 4 boilers to generate steam at 45 kg/cm^2 and 420^{0}C. The boilers existed prior to the project activity and are not part of the project, and no additional boilers will be installed as part of the project. Instead, existing steam generation will be used more effectively to generate additional electricity for supply to the grid. The project involves the installation of a new extraction cum condensing turbine. Steam generated by the boilers is collected in a common header from which it is directed to the various turbines. Steam passes through the new turbine to generate electricity at 11 kV. This is stepped up to 33 kV before transfer to the UPSEB grid. The sugar plant produces bagasse in excess of the requirements of the cogeneration plant (existing and new). Thus the project does not have to depend on external sources for raw materials. The salient features of the project are as follows:

Table A-1: Salient Features of the Dwarikesh Power Project

Bagasse produced at the facility	: 81 tons/hr on average
Capacity of steam generation	: 120 tons/hr
Turbine and alternator set	
Turbine condensing	: multistage bleed extraction
Inlet steam condition	: 45 kg/cm^2 at 420^{0}C
Installed capacity	: 8 MW
Generating voltage	: 11 kV
Turbine make	: Triveni
Alternator make	: Bhel
Transmission line	
Voltage	: 33 kV
Distance	: 11 km
Number of electricity poles	: 106

A line diagram of the technological setup is as follows:



* CDM project component

Figure A-1: Flow Diagram of Steam and Power of Dwarikesh Sugar Industries

The technology implemented by the project activity is environmentally safe and sound and generates clean renewable energy.

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

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It is estimated that the proposed project activity will lead to the reduction of 152,068 tCO_2eq in the first 7-years of the renewable crediting period chosen for the project activity.

The following table provides the details on generation of emission reductions during this period.

Table A-2: Estimated Emission Reductions

Years	Annual estimation of emission reductions in tonnes of CO_2e
2008	21,724
2009	21,724
2010	21,724
2011	21,724
2012	21,724
2013	21,724
2014	21,724
Total estimated reductions (tonnes of CO_2 e)	**152,068**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO2 e)	**21,724**

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

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The project does not receive any public funding from Parties included in Annex I of the UNFCCC.

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

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The proposed project activity is not a debundled component of a larger project activity. According to Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM Project Activities, a proposed small-scale project activity is considered a debundled component of a large scale project activity if there is a registered small-scale CDM project activity or an application to register another small-scale project activity:

- With the same project participants;
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point

Since the above is not true for the proposed CDM project activity, it is not a de-bundled component of a large project activity.

SECTION B. Application of a baseline and monitoring methodology

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

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The approved baseline methodology applied to the project activity is AMS I.D. – Grid connected renewable electricity generation, Version 10, 23 December 2006.

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

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According to Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM Project Activities, Category I.D. comprises renewable energy generation units such as photovoltaics, hydro, tidal/wave, wind, geothermal, and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit.

The proposed project activity involves the installation of a new renewable energy generation unit. This unit uses steam generated through combustion of bagasse as fuel in order to generate electricity and 7.5 MW is supplied to the Uttar Pradesh State Electricity Board (UPSEB) which is a part of the larger Northern Regional Grid of India.

The methodology further states that in case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.

The proposed project activity involves the addition of new capacity of renewable electricity generation. The addition is an 8 MW turbine next to an existing capacity of 3 x 3 MW that was used for captive consumption as well as 2 MW of grid supply. The new unit added is therefore lower than 15 MW. The existing turbines continue to operate after the implementation of the project activity. Their generation will not be reduced as a result of the project activity, but they will now be used entirely for captive consumption at the sugar plant, and 7.5 MW from the new turbine will be supplied directly to the grid. Captive consumption at the project plant has increased due to the commissioning of a 30 kilolitres per day distillery plant at DSIL. The distillery plant was established in order to utilize molasses, another by-product of the sugar industry.

The new turbine is physically distinct from the 9 MW of previous capacity and is dedicated entirely for supplying electricity to the grid. The new turbine uses excess steam generated by the four existing boilers and is capable of generating electricity without the operation of existing units, and does not directly affect the mechanical, thermal or electrical characteristics of the existing facility.

The project activity is therefore applicable to the type and category I.D. of small scale project activities.

B.3. Description of the project boundary:

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According to Category I.D. of small scale project activities, the project boundary encompasses the physical, geographical site of the renewable generation source.

The spatial extent of the project boundary encompasses the power plant at the project site and all power plants connected physically to the Northern Regional Grid in India that the proposed project plant is connected to. The project activity exports power to the Uttar Pradesh State Electricity Board (UPSEB) which is part of the Northern Regional Grid of India. Electricity generated for the Northern Grid of India comprises a combination of fossil and renewable fuel sources – as of 31.03.07 the generation mix is 64%

thermal, 23.3% hydro, 10.3% gas, 2.3% nuclear and 0.4% non-conventional energy sources[1]. The Carbon emission factor for baseline emission calculations is thus based on power plants connected to the Northern Regional Grid.

There are no emission sources related to the project activity since there is no combustion of fossil fuels on-site for the biomass power plant[2] and there is no transportation of biomass to the project site since the required biomass is available on site as a by-product of the sugar factory. For the purpose of determining the baseline, the following emission sources are included:

- CO_2 emissions from fossil fuel fired power plants connected to the electricity system

The following is a schematic diagram of the project boundary.

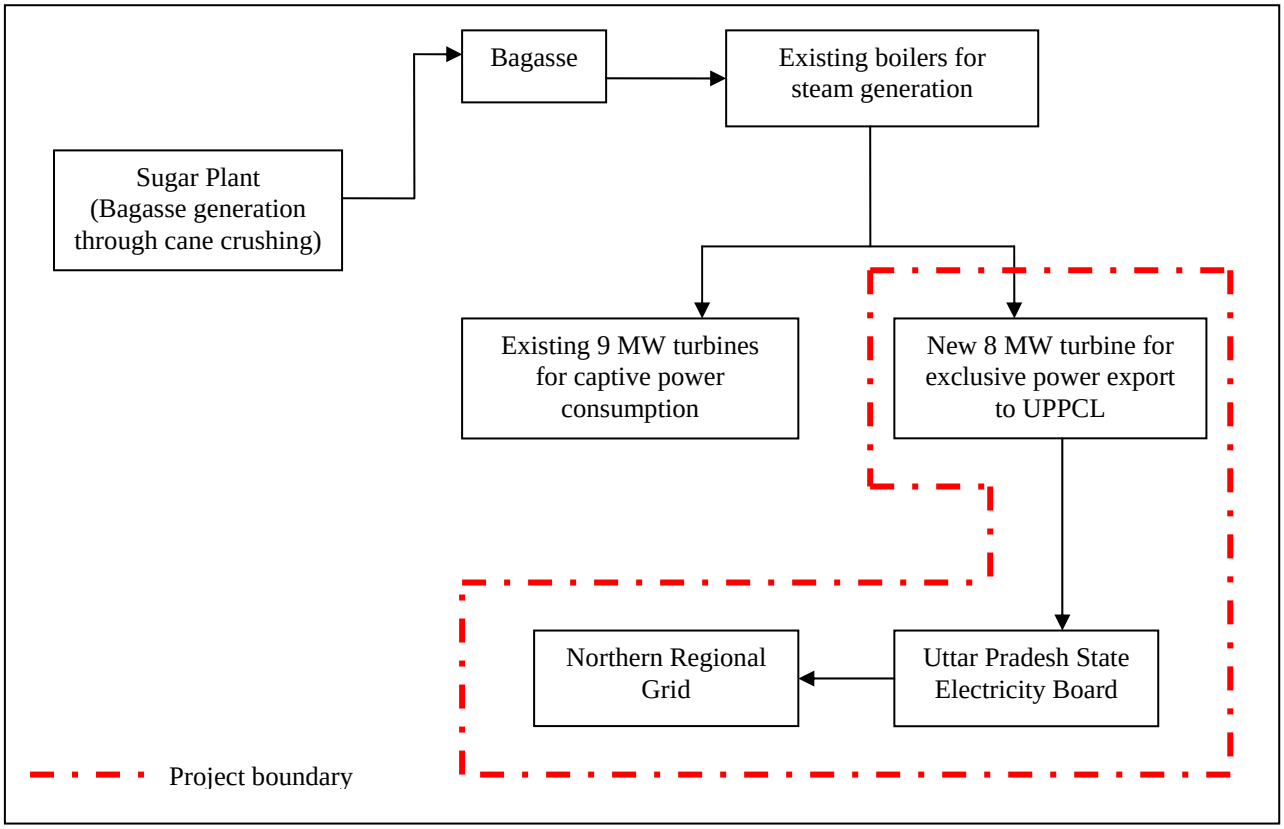

Figure B-1: Project boundary of the CDM project activity

B.4. Description of baseline and its development:

[1] Northern Regional Power Committee Annual Report 2006-07.

[2] Diesel fuel is used for boiler start ups however this is considered to be a part of the baseline since the amount of diesel fuel used before and after the project scenario has remained the same. As only the turbine is the project activity, the diesel fuel does not need to be accounted for.

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According to the selected methodology AMS I.D. for the proposed project activity, the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2equ/kWh) calculated in a transparent and conservative manner as a combined margin (CM) consisting of the combination of operating margin (OM) and build margin (BM) of the Northern Regional Grid of India, according to the procedures prescribed in the most recent version of the approved methodology ACM0002.

The Central Electricity Authority (CEA) of India provides official data on the combined margin (CM) emission factor for regional grids in India in their publication 'CO_2 baseline database for the Indian power sector', Version 2.0, June 2007. This publication has been utilized for grid emission factor for the Northern Grid and this emission factor is fixed ex-ante for the entire crediting period of the project activity.

Data used to determine the baseline is given in the table below. As the project activity involves the addition of renewable energy generation units at an existing renewable power generation facility, where the existing and new units share the use of common and limited renewable resources (e.g. streamflow, reservoir capacity, biomass residues), in accordance with AMS I.D., the potential for the project activity to reduce the amount of renewable resource available to, and thus electricity generation by, existing units is considered in the determination of baseline emissions; please refer to section B.6.1 for more information.

Data/Parameter	Value	Source
Electricity generated by the renewable generating unit (MWh)	27,154	Facility records
Combined Margin (CM) of Northern Grid (tCO_2/MWh)	0.80	CEA CO_2 Baseline Database

The baseline study was conducted by project participant and carbon advisor EcoSecurities Group PLC and concluded on 15/02/2007.

Contact: Noora Singh
noora.singh@ecosecurities.com

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

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The following section explains why this project is additional and would not have occurred in the absence of CDM revenues. CDM had been considered from the early stages of the project, as evidenced by the note placed before the meeting of the board of directors of the company dated 21/11/2003, and, as shown by the financial analysis below, CDM revenue is an integral part of the financial package of the project. With reference to Attachment A to Appendix B of the Simplified Modalities and Procedures for Small-

Scale CDM Project Activities, the proposed project activity faces a number of barriers related to investment, prevailing practice and policy/regulation, and these are described below.

Investment/financial barrier

The proposed project activity faced an investment barrier due to high project investments and low returns. A financial analysis was thus conducted for the project with and without CDM revenues in order to assess the project IRR and NPV as the financial indicators of the project. The results of this analysis are presented in the table below (for details see Appendix 1):

	Without CDM	**With CDM**
Project IRR	10.54%	16.59%
NPV (USD)	46,872	998,659

Assumptions:

- For the purpose of financial analysis electricity tariff rate is based on the regulation published by the Uttar Pradesh Electricity Regulatory Commission (UPERC) and starts at USD 62.4/MWh for the year 2005[3].
- Costs included are total investment costs ($2,331,111), operational costs include the opportunity cost of bagasse and CDM development ($50,000), monitoring and verification costs ($10,000 in the case of the with Carbon scenario only). A 1% contingency is added to the costs.
- Revenue streams included the electricity sale revenue as well as the CER sale revenue
- Income tax is assumed at 35%[4] and depreciation at 10%.
- The discount rate is taken as 10%.

According to the analysis, the proposed project activity is not an economically attractive course of action for the project developer without CDM since the project IRR is only 10.5%. According to the most recent version of the 'Tool for the demonstration and assessment of additionality', a relevant benchmark for a project's IRR can be derived from government bond rates increased by a suitable risk premium to reflect private investment and/or project type. The benchmark is thus derived from Bloomberg, a reliable financial adviser that provides the country premium and risk free rate for India (see Appendix 2).

The benchmark is therefore the sum of the two rates:
Risk free rate: 7.9%
Country premium: 7.5%

Benchmark: 15.4%

The contribution from CDM revenue raises the project IRR to 16.6% and thus is an integral part of the financial package of the project.

Sensitivity analysis
The UPERC regulation on tariff makes available the tariff rate for purchase of electricity from renewable sources until 2010. However, after that time there are uncertainties in the tariff rate that are not under the control of the project developer. If and when UPERC revisits the tariff rate, it cannot be assumed that the tariff rate will be increased. In all likelihood, this rate may decrease as well in the future. Based on this fact, a sensitivity analysis has been conducted for the project without CDM revenues and with (i) a

[3] According to the PPA with UPSEB and recent amendment to tariff by UPERC
[4] http://incometaxindia.gov.in/general/filereturn.asp

change in tariff rate by 5%[5] from 2011 onwards and (ii) a change in electricity generation rate by 5%. Below is the result of this analysis (see Appendix 1):

	NPV	IRR
Increase in tariff by 5% from 2011	$437,999	13.58%
Decrease in tariff by 5% from 2011	-$344,255	Negative
Increase in electricity generation by 5%	$698,735	15.63%
Decrease in electricity generation by 5%	-$604,990	Negative

The IRR for the project activity shows that when the change in tariff favours the project, the IRR is still below the benchmark for the country and when the change in electricity generation favours the project, the IRR is slightly above the benchmark. However, it is unlikely that electricity generation will increase by much since electricity generation is dependent on the availability of bagasse which in turn is dependent on the cane crushed and number of operating days of the sugar plant. The number of operating days assumed for the financial analysis of the project is 162 days which is based upon 8 years of historical data and is unlikely to change by much. The project PLF in the last 3 years of operation has been 77% on average and it is assumed that the project will maintain a PLF of 95%. It is again unlikely that the PLF will increase by much. In light of these facts, it is unlikely that the electricity generated by the project plant will increase by much and even with a 5% increase the project IRR only just exceeds the benchmark. In all likelihood the electricity generated may decrease in the future. When both the tariff and electricity generation change do not favour the project, the IRR is negative indicating that the project is not financially attractive without CDM.

The project developer also faced difficulty securing financing for the project and had to repeatedly request the Uttar Pradesh Power Corporation Limited (UPPCL) and the state regulatory authority UPERC for time extensions to set up the power plant against the date set out in the PPA. The project developer initially requested time extension from 01.03.03 to 30.06.04, however, could not proceed as planned and had to submit another time extension request. In their second request, the project developer asked for time extension from 30.06.04 to 31.12.04[6]. The consideration of CDM thus formed an essential component of the project. It helped to raise the returns on investment and to alleviate the perceived risks associated with opportunity costs.

Institutional barrier

The Uttar Pradesh Power Corporation Limited (UPPCL) is the state company responsible for transmission and distribution of electricity in most parts of the state of Uttar Pradesh. The proposed project exports power generated to UPPCL, which is part of the larger Northern Regional Grid of India. UPPCL is the only buyer of power in the area and the project is thus subject to price fluctuations imposed by the state grid and also to technical complications like transmission losses and grid failures. The Northern Regional Load Dispatch Center (NRLDC) reports grid incidents with a frequency of one incident per month on average in the year 2003-04 and two incidents per month in the year 2004-05[7] and according to the PPA, transmission losses for this project are to be borne by the project developer. In their previous experience supplying power to the state utility, the project developer has incurred financial losses due to grid failures.

[5] Just above the current inflation rate for India of 4.5% according to www.Economist.com
[6] Dwarikesh letter no. DSIL/DN/6513/2002 and letter no. DSIL/DN/Co-gen/984
[7] NRLDC Annual Reports 2003-04 and 2004-05

For instance in the year 2003-04 total grid failures amounted to 41.96 hours of power supply loss which incurred financial losses of INR 226,584 ($ 5,035) based on the prevalent tariff rate at the time.

Prior to the electricity reforms in 1999, the state utility in Uttar Pradesh was represented solely by the Uttar Pradesh State Electricity Board (UPSEB). Reforms were enacted in the state because of the declining performance of the power sector due to lack of investments. UPSEB was in a critical financial situation and, as of 1997, the accumulated commercial losses excluding state subsidies were of the order of INR 7,000 crores ($1.5 billion), and cash liabilities of the order of INR 4,200 crores ($933.3 million). UPSEB was not able to meet its operational cash requirement because of high losses, poor bill collections and an un-remunerative tariff for some categories of consumers, resulting in poor creditworthiness. Such poor performance led to the Uttar Pradesh Electricity Reforms Act in 1999, which created UPERC and UPPCL in 2000. At the time the project developer signed a PPA with UPPCL, the company was only a year old and still faced major financial difficulties. According to profit and loss account of UPPCL, for the year ending 31.03.2003 net loss is INR 13.2 billion and for the year ending 31.03.2004 net loss is INR 2.6 billion and the accumulated loss carried forward is INR 53.3 billion[8]. In FY 2000-01, UPPCL reports aggregate technical and commercial losses as 52%, 53% in FY 2001-02 and 48% in FY 2002-03[9].

The state utility has also had a very unclear policy on non conventional sources of energy and related tariffs. UPERC issued practice directions for captive power generation and for renewable energy source based independent power producers only on 28.07.2000. These directions allowed for the sale of surplus power to the state from cogeneration projects at the rate of INR 2.25/kWh for the base year 1999-00 with 5% escalation each subsequent year. However, these directions were only valid for 5 years, after which both the practice directions and the tariff were subject to review. This created major uncertainty for the project developer at the time of project planning and commissioning. The existence of these uncertainties, and concerns that the tariff could be lowered, presented a significant barrier to the project developer prior to the decision to construct the project. This barrier was borne out by subsequent events: as suspected, right after commissioning of the project in early 2005, UPERC started the process of revision of the tariff from renewable and non-conventional projects, and on 18.07.05 came up with the revised tariff. The revised tariff does not allow for the 5% escalation and is significantly lower than the price under which the PPA was signed. According to the new tariff, the project developers received INR 2.86/kWh instead of INR 3.02/kWh in 2005-06, immediately after project commissioning[10]. This tariff is again valid only for 5 years and again there is a risk that the tariff could be lowered further in the future.

From past experience, the project developer has been charged INR 100,000 on average by the state utility for transmission line maintenance without doing any actual maintenance work and the project developer has had to bear transmission losses of around 1% on average. The state utility has also exercised a clause in the PPA to deduct 2.5% of amount billed as rebate to the utility for providing payment within 30 days of the bill date even when payment was made after 30 days. These have added up to INR 799,000 of income loss for the project developer until December 2003. The existence of these kinds of practices presented a significant barrier prior to project development, due to the real and perceived risks they pose to the project's profitability.

The dire financial state of the grid company and the frequency of grid imbalances described above pose major risks for power generation projects and disproportionately act as barriers to entry for small

[8] 'Balance Sheet of UPPCL for Year 2003-2004' published at UPPCL website www.uppcl.org/accounts.htm
[9] UPERC Tariff Order 7.6.03 Table 14, pg 33 and UPERC Final Order Tariff FY 05, Table 2.8, pg 25
[10] UPERC order on suo moto proceedings in the matter of Terms and Conditions of Supply and Tariff for Captive Generating Plants and Renewable and NCE source based plants.

independent power producers, like DSIL, based on renewable and non-conventional sources of energy. Small projects like the proposed project activity are more vulnerable to financial fluctuations and do not have the kind of bargaining power with the state utility, exercised by large conventional power plants. Large projects are more profitable and can better handle such risks as well as lobby the state utility because they supply continuous and large amounts of energy to the grid. DSIL cannot afford to have the grid company not pay or pay less for the amount of power supplied to the grid and therefore during project planning and construction, the institutional issues described above posed major uncertainties for the project developer. As such, the project developer had little incentive to carry out this project because in the business as usual scenario, they were generating enough power for captive consumption and selling bagasse in the market, which fetched a high price. The project had a low investment rate of return as described under financial barriers, and coupled with the institutional barriers mentioned in this section, the project was not a viable activity for DSIL without CDM.

Barriers due to prevailing practice

Bagasse cogeneration in India is a nascent business practice and most sugar mills do not undertake this type of project activity. Although it has been acknowledged that implementing cogeneration power plants for exporting surplus power to third party buyers is becoming increasingly important, the majority of sugar mills do not undertake this activity, due to the barriers identified above, and risk perception associated with non-core activities for sugar businesses. The total potential in India from 575 sugar mills spread across 9 major states has been identified at 3,500 MW of surplus power and 5,000 MW in case of energy-efficient systems. Against this potential, only about 432.53 MW from 56 projects have been commissioned as of December 2004 representing a mere 8% of the total potential[11]. The lack of innovative financing mechanisms, conducive policy and regulatory framework and adequate capacity are the barriers to sustainable growth in this sector.

The State of Uttar Pradesh is the largest sugar producing state in India with a total of 133 operating or proposed sugar mills spread across the state in various sectors (government owned – 22, cooperative – 28 and private 83)[12]. Bagasse based cogeneration plants are a recent phenomenon in the state and cannot be considered a prevailing business practice. The exportable surplus power potential, after meeting internal consumption for Uttar Pradesh, has been estimated at 1,000 MW by the Ministry of Non-Conventional Energy Sources (MNES). According to the UP Government, Cane Development Department, as of 30.06.2006 a total of 723.86 MW of cogeneration projects have signed PPAs and of these 194.36 MW have been commissioned, 352 MW are scheduled to commission in 2006-07, 156 MW are scheduled to commission in 2007-08 and 21.5 MW are of those firms that are not responding to execute plants[13]. The status of cogeneration in the state is provided in Appendix 3. Among the 47 sugar mills that supply or plan to supply electricity to the grid, only 10 have not been developed as CDM projects. The aggregate capacity of projects without CDM consideration is 112.7 MW which represents only 15.6% of the total cogeneration projects in the state. Therefore, it can be concluded that CDM plays an important role in the development of bagasse-based cogeneration projects in the state including the proposed project activity.

[11] Natu, S. C. 2006 'Bagasse Based Cogeneration, India Marching Ahead' MITCON Consultancy Services Ltd., Pune, India

[12] Based on information available at the Uttar Pradesh Ganna Vikas Vibhag website at http://www.upcane.org/sector_chini.htm

[13] Based on information available at the Uttar Pradesh Cane Development Department website at http://www.upcane.org/dist_ithano_3.htm

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

>>

Methodological choices for the calculation of baseline, project, leakage emissions and emission reductions are explained below for the small scale methodology AMS I. D. Version 10, 23 December 2006.

Baseline emissions

Baseline emissions are calculated as the increase in electricity production associated with the project multiplied by an emission coefficient calculated in a transparent and conservative manner according to choice (a) in the methodology – i.e. a combined margin (CM) consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the most recent version of the approved methodology ACM0002.

Official data on the emission factor of the regional grids is provided by CEA in India and is taken from their publication 'CO_2 baseline database for the Indian power sector', Version 2.0, June 2007. This emission factor is fixed ex-ante for the entire crediting period of the project activity.

Project emissions

Project emissions could potentially arise from any transportation to and any use of fossil fuels at the project site. These sources of emissions are eliminated for the project activity since the fuel source (bagasse) is generated on site and therefore does not involve any transportation to the project site. Bagasse generated at the sugar plant is directly conveyed to the boilers at the project site. Diesel fuel is used for boiler start-ups, however as the boilers are not part of the project boundary, project emissions from the diesel use does not need to be accounted for.

Leakage emissions

The project does not give rise to any leakage emissions because the energy generating equipment is not transferred from another activity and existing equipment is also not transferred to another activity. According to Attachment C, the only emission source applicable for the proposed project activity is competing uses for the biomass.

Bagasse is generated at the existing sugar mill owned and operated by the project developer. In the baseline, the generated bagasse was consumed in the boilers of the existing cogeneration facility and any surplus bagasse was sold to bagasse traders. According to data available for 9 years prior to the project activity, bagasse dispatched to the market amounted to 62,380 tonnes/yr on average. In comparison, data available for 2 years after the start of the project activity shows that dispatches are 24,066 tonnes/yr on average. A decrease of 38,314 tonnes/yr has been observed in the amount of bagasse that is sent to the market.

Major uses of bagasse in the region are for power generation and as a raw material for paper manufacturing[14]. Other biomass residues such as wheat straw, rice straw, rice husk, cotton stalks, etc. can also be used for these purposes. Therefore according to available data for the state of Uttar Pradesh[15],

[14] 'Major Industries in Uttar Pradesh', http://www.indiainbusiness.nic.in/indian-states/uttarpradesh/Maj_Ind.htm, accessed 15.11.2006

[15] Nationwide biomass resource assessment – India, http://lab.cgpl.iisc.ernet.in/CropReport/Default.aspx#a6, accessed 04.12.2007

i. Total biomass generation in the area = 53,404,300 tonnes/yr
ii. Total biomass consumption in the area = 41,066,700 tonnes/yr
iii. Total biomass availability reduction due to the project = 38,314 tonnes/yr
iv. Total consumption of biomass in the area (ii+iii) = 41,105,014 tonnes/yr
v. Total surplus in the region after consumption (i-iv) = 12,299,286 tonnes/yr
vi. Surplus biomass available in the region (v/iv) = 30%

The quantity of biomass available in the region is 25% larger than the total quantity of biomass that is utilized. Therefore this leakage emission is neglected for the proposed project activity.

Emission reductions

Emission reductions are thus calculated as the difference between baseline emissions project emissions and leakage emissions as,

$$ER_y = BE_y - PE_y - LE_y$$

Where,

ER_y = Emission reduction in year y (tCO_2e/yr)

BE_y = Baseline emission in year y (tCO_2e/yr)

PE_y = Project emission in year y (tCO_2e/yr)

LE_y = Leakage emission in year y (tCO_2e/yr)

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

(Copy this table for each data and parameter)

Data / Parameter:	**Combined Margin emission factor (CM)**
Data unit:	tCO_2/MWh
Description:	The Combined Margin CM emission factor is calculated as a combination of the operating margin and build margin emission factors of the relevant grid.
Source of data used:	'CO_2 baseline database for the Indian power sector' Version 2.0, June 2007.
Value applied:	0.80 tCO_2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is an official publication of the Government of India.
Any comment:	

Data / Parameter:	**Estimated electricity,** $WTE_{estimated,y}$
Data unit:	MWh
Description:	Estimated electricity production of the existing units
Source of data used:	Historical records of the facility
Value applied:	22,143 MWh

Justification of the choice of data or description of measurement methods and procedures actually applied :	This will be established once ex-ante on the basis of 5-year historical data on rated capacity and load factor (see below section B.6.3). Observed availability of the bagasse will remain the same.
Any comment:	Any calculations will be cross-checked to ensure accuracy.

B.6.3 Ex-ante calculation of emission reductions:

>>

The chosen small scale methodology AMS I.D. as provided in Appendix B, contains formulae for the estimation of baseline emissions as outlined below.

According to the methodology, baseline emissions are represented by:

$$BE_y = EG_y \cdot EF_y$$

Where,

BE_y = baseline emissions in tCO_2

EG_y = electricity supplied by the project activity to the grid (in MWh)

EF_y = baseline emissions factor (in tCO_2/MWh) calculated as the combined margin (CM) of the combination of operating margin (OM) and build margin (BM) according to the methodology ACM0002

Determination of EF_y

As mentioned earlier, this is determined based on official data from the CEA and is fixed ex-ante for the duration of the chosen crediting period.

Determination of EG_y

The project activity involves the addition of a new turbine to supply 7.5 MW electricity to the grid at Dwarikesh Sugar Industries Limited where 9 MW of renewable power generation capacity already exists. There are four boilers and turbines at the project plant that use bagasse from the sugar manufacturing process as the fuel and are part of the baseline. The proposed project activity only installs a new turbine at the site that uses excess steam generated by the existing boilers. The sugar plant is currently generating bagasse in excess of captive requirements and thus even though the new and existing units share the same renewable resource, there is no potential for the project activity to reduce the amount of bagasse available to and thus electricity generation by the existing units. The following table provides bagasse generation and consumption figures of the plant in order to establish this fact.

Description	**Comparative Bagasse Figures for the Last 6 Seasons**					
	2000-01	**2001-02**	**2002-03**	**2003-04**	**2004-05***	**2005-06**
Cane Crushed (tonnes)	657,506	749,820	864,779	751,893	801,465	720,540
Production (tonnes)	244,592	268,533	316,682	242,504	240,383	230,638
Consumption (tonnes)	173,369	197,453	234,684	187,663	214,198	208,690
% Consumed	71%	74%	74%	77%	89%	90%

*Commencement of the new cogeneration plant.

Thus according to the table above, even after the commencement of the new plant, a 10% surplus of bagasse exists at the sugar plant. It can therefore be ascertained that the project plant does not limit resources for the existing units and no reduction of electricity generation occurs.

The increase in electricity production associated with the project activity (EG_y in MWh) is calculated as,

$$EG_y = TE_y - WTE_y$$

Where,

TE_y = the total electricity produced in year y by all units, existing and new units

WTE_y = the estimated electricity that would have been produced by existing units (installed before the project activity) in year y in the absence of the project activity, where,

$$WTE = MAX\left(WTE_{actual,y}, WTE_{estimated,y}\right)$$

Where,

$WTE_{actual,y}$ = the actual, measured electricity production of the existing units in year y

$WTE_{estimated,y}$ = the estimated electricity that would have been produced by the existing units under the observed availability of the renewable resource for year y

As mentioned above, the project plant does not affect the existing units by limiting bagasse available to the existing units. The actual amount of electricity generated by the existing units will be monitored throughout the crediting period of the project, while the estimated generation of the existing units is determined ex-ante based on historical data on the rated capacity and load factor of the existing units. The following table provides historical data on the existing unit.

		1999-00	**2000-01**	**2001-02**	**2002-03**	**2003-04**	**Average**
Rated capacity	MW	9	9	9	9	9	9
Electricity generation	MWh	16,880	16,388	22,464	29,733	25,799	22,253
Season days of operation	days	152	157	164	185	150	162
Plant load factor	%	51.4%	48.3%	63.4%	74.4%	79.6%	63.4%

Based on the historical average load factor and rated capacity, the estimated electricity that would have been generated by the existing units is determined ex-ante as 22,143 MWh.

As discussed earlier in section B.6.1, there are no project or leakage emissions associated with the project. Emission Reductions are thus calculated as,

$ER_y = BE_y - PE_y - LE_y$ or $ER_y = BE_y$ for the project activity, where

ER_y = Emission reduction in year y (tCO_2e/yr)

BE_y = Baseline emission in year y (tCO_2e/yr)

PE_y = Project emission in year y (tCO_2e/yr)

LE_y = Leakage emission in year y (tCO_2e/yr)

Details of emission reduction calculations along with relevant data are provided in Annex 3.

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

>>

The following table provides the estimate of emission reductions obtained for the first crediting period of the project activity.

Year	Estimation of Project Activity Emission Reductions (tCO_2eq)	Estimation of Baseline Emission Reductions (tCO_2eq)	Estimation of Leakage (tCO_2eq)	Estimation of Emission Reductions (tCO_2eq)
2008	0	21,724	0	21,724
2009	0	21,724	0	21,724
2010	0	21,724	0	21,724
2011	0	21,724	0	21,724
2012	0	21,724	0	21,724
2013	0	21,724	0	21,724
2014	0	21,724	0	21,724
Total (tonnes of CO_2eq)	**0**	**152,068**	**0**	**152,068**

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

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	**Net electricity exported by the new plant** $E_{\text{exp},y}$
Data unit:	MWh
Description:	Net electricity exported to the grid by the new project plant
Source of data to be used:	Facility records
Value of data	27,154
Description of measurement methods and procedures to be applied:	The net electricity exported to the grid by the project plant (1 x 8 MW unit) will be measured by main and check power meter installed at Najibabad Substation located at 10 km from the project site. Meters are read jointly by representatives from DSIL and UPPCL and the data will be recorded monthly.
QA/QC procedures to	Meters are under the custody of UPPCL and will be calibrated according to terms

be applied:	of the PPA or frequency decided by UPPCL. Metered electricity recorded will be cross-checked with electricity sales invoices.
Any comment:	Net electricity export represents electricity generated by the project plant less auxiliary consumption and any transmission losses. Data will be recorded throughout the crediting period plus 2 years

Data / Parameter:	**Actual electricity generated by old units** $WTE_{actual,y}$
Data unit:	MWh
Description:	Actual electricity generated by all units at the project site that existed prior to the implementation of the project activity
Source of data to be used:	Facility records
Value of data	22,253 MWh
Description of measurement methods and procedures to be applied:	Electricity generated by the existing 3 x 3 MW units will be measured by power meters. Data will be recorded monthly.
QA/QC procedures to be applied:	Meters will be subject to proper repair and maintenance. Meters will be calibrated and/or replaced (if necessary) according to the manufacturer's recommendation.
Any comment:	Data will be recorded throughout the crediting period plus 2 years

Data / Parameter:	**Total electricity generated at the site** TE_y
Data unit:	MWh
Description:	Total electricity generated at the project site by all units, existing and new
Source of data to be used:	Calculated on the basis of facility records
Value of data	49,407 MWh
Description of measurement methods and procedures to be applied:	The total electricity generated will be calculated as the aggregate of electricity generated by the existing 3 x 3 MW units and the net electricity export of the new 1 x 8 MW unit. Data will be recorded monthly.
QA/QC procedures to be applied:	
Any comment:	Data will be recorded throughout the crediting period plus 2 years

Data / Parameter:	**Biomass availability in the region**
Data unit:	Tonnes
Description:	Quantity of biomass available in the region where the project plant is located
Source of data to be used:	Survey data
Value of data	N/A
Description of measurement methods and procedures to be applied:	An annual review of literature available /Government Records or field survey shall be carried out to compile data on the yield, consumption and availability of surplus biomass in the region.
QA/QC procedures to	Literature on biomass availability will be derived from official sources or in case

be applied:	of a survey, a third party consultant will be hired.
Any comment:	

B.7.2 Description of the monitoring plan:

>>

Monitoring plan

This section details the steps taken to monitor on a regular basis the GHG emissions reductions from the Dwarikesh 8 MW Bagasse-Based Power Generation Project, Bijnor, UP in India.

The Monitoring Plan for this project has been developed to ensure that from the start, the project is well organised in terms of the collection and archiving of complete and reliable data.

Prior to the start of the crediting period, the organisation of the monitoring team will be established. Clear roles and responsibilities will be assigned to all staff involved in the CDM project.

A formal set of monitoring procedures will be established prior to the start of the project. These procedures will detail the organisation, control and steps required for certain key monitoring system features (see Annex 4 for further information), including:

a) CDM staff training
b) CDM data and record keeping arrangements
c) Data collection
d) CDM data quality control and quality assurance
e) Equipment maintenance
f) Equipment calibration
g) Equipment failure

This will ensure that high quality data is obtained. Specifically, data and records that will be checked prior to being stored and archived. Data from the project will be checked to identify possible errors or omissions. The data checks will include cross checks of the electricity meters, and checks of the electricity figures on the receipts. All records will be checked for completeness.

All data required for verification and issuance will be kept for at least two years after the end of the crediting period or the last issuance of CERs of this project, whichever occurs later. Data will be archived electronically and data backup through the main server will be maintained. Paper data back up will also be available.

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

>>

Date of completion of the application of the baseline and monitoring methodology – 15.02.07

Responsible entity is the project developer and EcoSecurities Group Plc (full contact details can be found in Annex 1)
Contact: Noora Singh
Email: noora.singh@ecosecurities.com

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:

>>
Date of equipment purchase contract signed: 9/12/2003

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:

>>
The crediting period will start on 01/04/2008 or on the date of registration of the CDM project activity whichever is later.

C.2.1.2. Length of the first crediting period:

>>
7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

C.2.2.2. Length:

>>

SECTION D. Environmental impacts

>>

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

>>
The Government of India does not require a formal analysis of environmental impacts for projects of the size and scale of the proposed project activity. The proposed project involves capacity addition to an existing captive generation plant and thus does not involve any major construction operations. The project is a CO_2 neutral biomass-based power plant designed to supply electricity to the grid. As the power

station is based on biomass (bagasse), there is no emission of poisonous gases or effluents to pollute the atmosphere, water etc.

The proposed project will not undertake any other activity, which will adversely affect the ecological balance in area.

The project will have local environmental benefits associated with displacement of power supply to the grid from GHG intensive sources. The project will reduce the reliance of the region and the country as a whole on fossil fuels.

The project also generated some employment opportunities for the local people of the area.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

Environmental impacts are not considered significant.

SECTION E. Stakeholders' comments

>>

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

>>

The stakeholder consultation process has been completed. Relevant participants were identified based on the nature of the project activity and letters were sent out to them with a brief description of the project activity and inviting them to submit any comments they might have on the project. A list of the participants is provided in Appendix 4. The packet sent out consisted of a cover letter, an introduction to CDM and an explanation of the project. Stakeholders were invited to submit comments within a period of 15 days.

Apart from this, a public announcement was placed in the local newspaper, 'Bijnor Times', for wider stakeholder consultation. The announcement gave a brief explanation of the project and invited readers to submit comments or ask for further information.

E.2. Summary of the comments received:

>>

No comments were received.

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

>>

No comments were received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Dwarikesh Sugar Industries Limited
Street/P.O.Box:	221, Nariman Point
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Represented by:	
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Salutation:	Mr.
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Represented by:	
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Last Name:	Moura Costa
Middle Name:	
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Mobile:	
Direct FAX:	

Direct tel:	+44 1865 202 635
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is used in the project activity.

Annex 3

BASELINE INFORMATION

The proposed project activity is a capacity expansion project that supplies electricity to the state grid. According to the chosen methodology AMS I.D., Version 10, 23rd December, 2006, the electricity generated of the project is determined based on the total electricity generated at the project site (including existing and new units) and the estimated electricity generated by the existing units. Electricity generated by the project plant thus determined is then multiplied by the grid emission factor in order to determine the baseline. Grid emission factor for the Northern Regional Grid of India is determined from official data published by the Central Electricity Authority (CEA) of India in 'CO_2 Baseline Database for the Indian Power Sector' Version 2.0, June 2007.

Northern Regional Grid emission factor = 0.80 tCO_2e/MWh

The following generation data is used for baseline determination.

Estimated Power Generation	
Utilized capacity (MW)	7.5
Number of operating days per year	162
Plant load factor (%)	95%[16]
Power generated (MWh)	29,088
Auxiliary consumption (%)	2%
Annual Net Power Output to Grid (MWh)	**27,154**
Actual electricity generation of old units (MWh)	22,253 based on historical data
Estimated electricity by old units (MWh)	22,143 based on historical data on capacity and load factor
Estimated electricity, WTEy (MWh)	22,253 (maximum of actual and estimated)
Total electricity generated at site TEy (MWh)	49,407
Electricity associated with project EGy (MWh)	**27,154**

[16] Due to gradual improvement in operations, the plant load factor is expected to reach it's maximum from the 4th year of operation onward

Annex 4

MONITORING INFORMATION

CDM Monitoring System Procedures to be implemented

Procedure name	Description
CDM Staff training	This procedure outlines the steps to ensure that staff receives adequate training to collect and archive complete and accurate data necessary for CDM monitoring.
CDM data and record keeping arrangements	This procedure provides details of the sites data and record keeping arrangements. The arrangements ensure that complete and accurate records are retained by the CDM Manager within the quality control system. Data and records will be stored and archived according to this procedure.
Data collection	This procedure will outline the steps to collect the data from the various measurement equipments.
CDM data quality control and quality assurance	Data and records will be checked prior to being stored and archived. Data from the project will be checked to identify possible errors or omissions. All records will be checked for completeness.
Equipment maintenance	This procedure outlines the steps to provide regular and preventative maintenance to the measurement equipments.
Equipment calibration (if applicable)	This procedure details the process of organising and managing the calibration process. The procedure includes details of how a suitable company or organisation is commissioned to undertake the calibration.
Equipment failure	This procedure details the steps to be taken in case of equipment failure.

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Appendix 1

Financial Analysis Data

ASSUMPTIONS

PROJECT DATA	
Capacity of plant (MW)	8
Auxiliary consumption (%)	2%
Distribution loss (%)	0%
CEF grid (tCO_2e/MWh)	0.80
Methodology (Small/Large scale)	Small
Date project starts operating (year)	2005

FINANCIAL PARAMETERS	
Electricity tariff (U$/MWh)	62.4
Rate of increase of tariff (%/yr)	0.0%
Price of bagasse (U$/tonne)	17.8
Escalation in bagasse price (%)	4%
Income tax (%)	35%
Discount rate	10%
Price of carbon (US$/$tCO_2e$)	12.00
Validation and registration costs ($)	50,000
Verification costs ($)	10,000

COSTS AND EQUIPMENT (US$)	
(if known, override it, otherwise use generic defaults below)	
Pre-operational Costs (U$)	0
Total Investment (U$)	2,331,111
Office and administration expenses (U$/yr)	24,444
Escalation on office and admin expenses (%)	10%
Contingencies (%)	1%

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
1	**Project Profitability Statement**																												
4		Assump.	*0*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
5			*2004*	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**Total**
6	**I) Electricity Generation**																												
7	Saleable units (MWh)			*17,903*	*19,436*	*28,314*	*27,154*	*27,154*	*27,154*	*27,154*	*27,154*	*27,154*	*27,154*	*27,154*	*27,154*	*27,154*	*27,154*	*27,154*	*27,154*	*27,154*	*27,154*	*27,154*	*27,154*	*27,154*	*27,154*	*27,154*	*27,154*	*27,154*	$663,051
8																													
9	Emission reductions (tCO_2e/yr)			*0*	*0*	*0*	*21,724*	*21,724*	*21,724*	*21,724*	*21,724*	*21,724*	*21,724*	*21,724*	*21,724*	*21,724*	*21,724*	*21,724*	*21,724*	*21,724*	*21,724*	*21,724*	*21,724*	*21,724*	*21,724*	*21,724*	*21,724*	*21,724*	$456,194
10																													
11	**REVENUE**																												
12	Tariff (US$/MWh)	62.44																											
13	Tariff escalation (%)	0%		$62.44	$63.56	$64.22	$65.11	$66.00	$67.11	$67.11	$67.11	$67.11	$67.11	$67.11	$67.11	$67.11	$67.11	$67.11	$67.11	$67.11	$67.11	$67.11	$67.11	$67.11	$67.11	$67.11	$67.11	$67.11	
14	Net Electricity Revenue (US$)			$1,117,972	$1,235,281	$1,818,393	$1,768,055	$1,792,193	$1,822,364	$1,822,364	$1,822,364	$1,822,364	$1,822,364	$1,822,364	$1,822,364	$1,822,364	$1,822,364	$1,822,364	$1,822,364	$1,822,364	$1,822,364	$1,822,364	$1,822,364	$1,822,364	$1,822,364	$1,822,364	$1,822,364	$1,822,364	$1,822,364	$44,179,177
15																													
16	Carbon price (US$/$tCO_2e$)	0.00																											
17	Carbon revenue (US$)			$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
18																													
19	**Total Revenue (US$)**			**$1,117,972**	**$1,235,281**	**$1,818,393**	**$1,768,055**	**$1,792,193**	**$1,822,364**	**$1,822,364**	**$1,822,364**	**$1,822,364**	**$1,822,364**	**$1,822,364**	**$1,822,364**	**$1,822,364**	**$1,822,364**	**$1,822,364**	**$1,822,364**	**$1,822,364**	**$1,822,364**	**$1,822,364**	**$1,822,364**	**$1,822,364**	**$1,822,364**	**$1,822,364**	**$1,822,364**	**$1,822,364**	**$1,822,364**	**$44,179,177**
20																													
21	**COSTS**																												
22	Additional bagasse consumption (tonnes/yr)	48,089																											
23	Price of bagasse (US$/tonne)	17.78												*48%*															
24	Escalation in price of bagasse (%)	4.0%		$18.49	$19.23	$20.00	$20.80	$21.63	$22.49	$23.39	$24.33	$25.30	$26.32	$27.37	$28.46	$29.60	$30.79	$32.02	$33.30	$34.63	$36.01	$37.46	$38.95	$40.51	$42.13	$43.82	$45.57	$47.39	
25	Total bagasse cost (US$)			$889,115	$924,679	$961,667	$1,000,133	$1,040,139	$1,081,744	$1,125,014	$1,170,014	$1,216,815	$1,265,488	$1,316,107	$1,368,751	$1,423,502	$1,480,442	$1,539,659	$1,601,246	$1,665,295	$1,731,907	$1,801,184	$1,873,231	$1,948,160	$2,026,087	$2,107,130	$2,191,415	$2,279,072	$37,027,995
26	Office and administration expenses (US$)			$24,444	$26,889	$29,578	$32,536	$35,789	$39,368	$43,305	$47,635	$52,399	$57,639	$63,403	$69,743	$76,717	$84,389	$92,828	$102,111	$112,322	$123,554	$135,909	$149,500	$164,450	$180,895	$198,984	$218,883	$240,771	$2,404,039
27																													
28	Carbon offset monitoring and verification (US$)			$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
29																													
30	**Total Costs (US$)**			**$913,559**	**$951,568**	**$991,244**	**$1,032,669**	**$1,075,928**	**$1,121,112**	**$1,168,319**	**$1,217,650**	**$1,269,214**	**$1,323,126**	**$1,379,510**	**$1,438,494**	**$1,500,219**	**$1,564,830**	**$1,632,487**	**$1,703,356**	**$1,777,617**	**$1,855,461**	**$1,937,093**	**$2,022,731**	**$2,112,610**	**$2,206,982**	**$2,306,114**	**$2,410,298**	**$2,519,843**	**$39,432,035**
31																													
32	**PBIDT**			**$204,413**	**$283,712**	**$827,148**	**$735,386**	**$716,265**	**$701,252**	**$654,045**	**$604,714**	**$553,150**	**$499,238**	**$442,854**	**$383,870**	**$322,146**	**$257,534**	**$189,877**	**$119,008**	**$44,747**	**-$33,097**	**-$114,728**	**-$200,367**	**-$290,246**	**-$384,617**	**-$483,750**	**-$587,934**	**-$697,479**	**$4,747,143**
33																													
34	Financial expenses																												
35	Interest on term loan (US$)			$209,000	$191,400	$185,533	$163,167	$124,300	$85,433	$49,500	$16,500	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,024,833
36																													
37	**PBDT**			**-$4,587**	**$92,312**	**$641,615**	**$572,220**	**$591,965**	**$615,819**	**$604,545**	**$588,214**	**$553,150**	**$499,238**	**$442,854**	**$383,870**	**$322,146**	**$257,534**	**$189,877**	**$119,008**	**$44,747**	**-$33,097**	**-$114,728**	**-$200,367**	**-$290,246**	**-$384,617**	**-$483,750**	**-$587,934**	**-$697,479**	**$3,722,309**
38																													
39	Depreciation			$233,111	$233,111	$233,111	$233,111	$233,111	$233,111	$233,111	$233,111	$233,111	$233,111	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,331,111
40																													
41	**PBT**			**-$237,698**	**-$140,799**	**$408,504**	**$339,109**	**$358,854**	**$382,708**	**$371,434**	**$355,103**	**$320,039**	**$266,127**	**$442,854**	**$383,870**	**$322,146**	**$257,534**	**$189,877**	**$119,008**	**$44,747**	**-$33,097**	**-$114,728**	**-$200,367**	**-$290,246**	**-$384,617**	**-$483,750**	**-$587,934**	**-$697,479**	**$1,391,198**
42																													
43	Provision for tax	35.00%		$0	$0	$142,976	$118,688	$125,599	$133,948	$130,002	$124,286	$112,014	$93,144	$154,999	$134,354	$112,751	$90,137	$66,457	$41,653	$15,662	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,596,670
44																													
45	**PAT**			**-$237,698**	**-$140,799**	**$265,527**	**$220,421**	**$233,255**	**$248,760**	**$241,432**	**$230,817**	**$208,025**	**$172,982**	**$287,855**	**$249,515**	**$209,395**	**$167,397**	**$123,420**	**$77,355**	**$29,086**	**-$33,097**	**-$114,728**	**-$200,367**	**-$290,246**	**-$384,617**	**-$483,750**	**-$587,934**	**-$697,479**	**-$205,471**
46																													
47	Add: depreciation and other write offs			$233,111	$233,111	$233,111	$233,111	$233,111	$233,111	$233,111	$233,111	$233,111	$233,111	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,331,111
48																													
49	**Net cash accruals**			**-$4,587**	**$92,312**	**$498,639**	**$453,532**	**$466,366**	**$481,871**	**$474,543**	**$463,928**	**$441,137**	**$406,093**	**$287,855**	**$249,515**	**$209,395**	**$167,397**	**$123,420**	**$77,355**	**$29,086**	**-$33,097**	**-$114,728**	**-$200,367**	**-$290,246**	**-$384,617**	**-$483,750**	**-$587,934**	**-$697,479**	**$2,125,640**

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
1	**IRR Analysis**																												
2																													
3																													
4	**PROJECT IRR**		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Total
5																													
6	**Investment**																												
7	Pre-operational Costs	$0																											
8	Investment	$2,331,111																											
9	Carbon offset monitoring and verification	$0																											
10	Contingencies	$23,311																											
11	**Total investment**		**-$2,354,422**																										
12																													
13	**PAT**			**-$237,698**	**-$140,799**	**$265,527**	**$220,421**	**$233,255**	**$248,760**	**$241,432**	**$230,817**	**$208,025**	**$172,982**	**$287,855**	**$249,515**	**$209,395**	**$167,397**	**$123,420**	**$77,355**	**$29,086**	**-$33,097**	**-$114,728**	**-$200,367**	**-$290,246**	**-$384,617**	**-$483,750**	**-$587,934**	**-$697,479**	**-$205,471**
14																													
15	Add: Depreciation			$233,111	$233,111	$233,111	$233,111	$233,111	$233,111	$233,111	$233,111	$233,111	$233,111	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,331,111
16																													
17	Add: Interest* (1-tax)			$0	$0	$120,597	$106,058	$80,795	$55,532	$32,175	$10,725	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$405,882
18																													
19	**Net cash flows**		**-$2,354,422**	**-$4,587**	**$92,312**	**$619,235**	**$559,590**	**$547,161**	**$537,403**	**$506,718**	**$474,653**	**$441,137**	**$406,093**	**$287,855**	**$249,515**	**$209,395**	**$167,397**	**$123,420**	**$77,355**	**$29,086**	**-$33,097**	**-$114,728**	**-$200,367**	**-$290,246**	**-$384,617**	**-$483,750**	**-$587,934**	**-$697,479**	**$2,531,521**
20																													
21																													
22	Net Present Value ($)	46,872																											
23	IRR	10.54%																											
24	Discount rate	10%																											

Sensitivity Analysis

Change in tariff rate 5% year 7 onwards

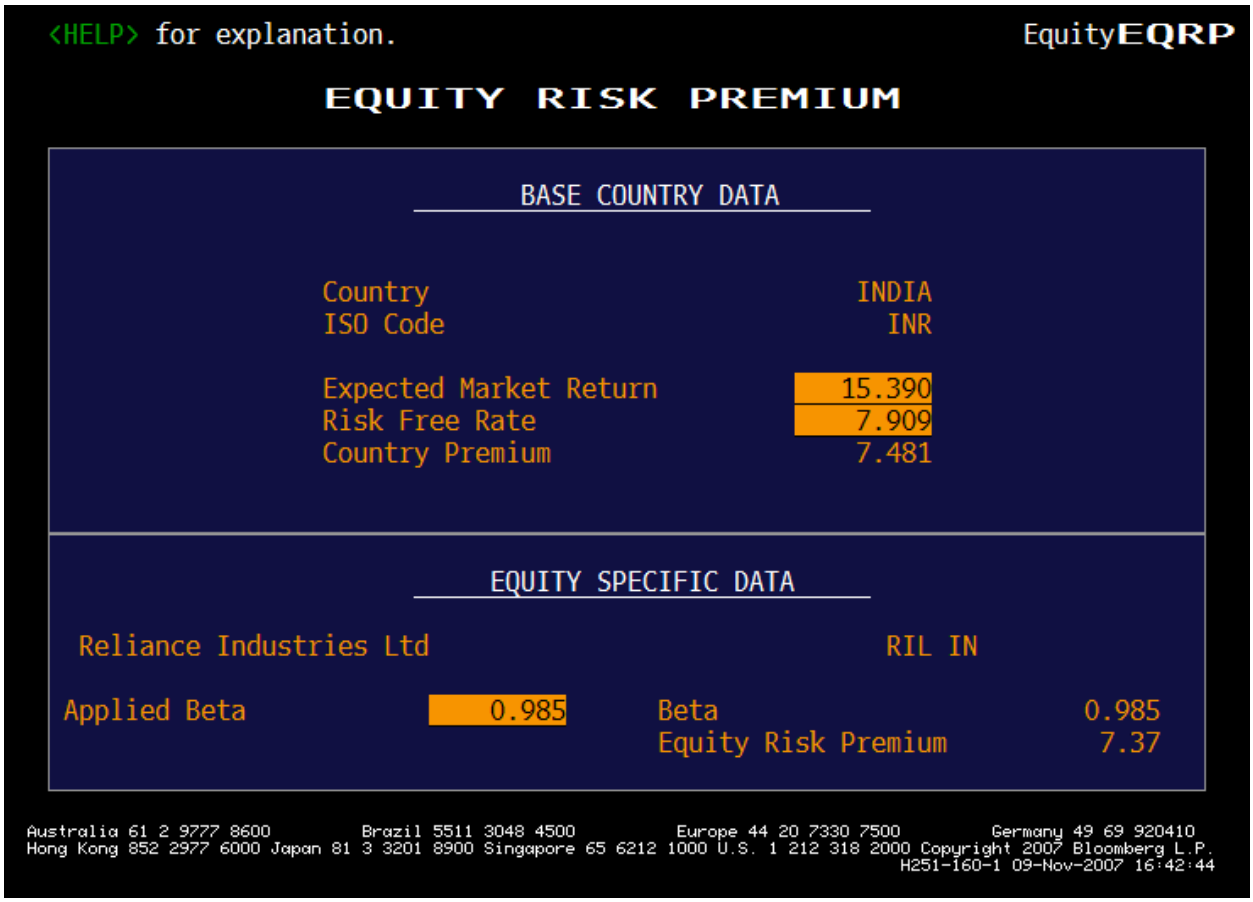
	NPV	IRR
Increase in tariff	$437,999	13.58%
Decrease in tariff	-$344,255	#DIV/0!

Change in electricity generation 5%

	NPV	IRR
Increase in generation	$698,735	15.63%
Decrease in generation	-$604,990	#NUM!

Appendix 2

Print out from a database accessible through an agreement between EcoSecurities and Bloomberg, obtained through communications with the Help Desk.



Appendix 3

Status of cogeneration based power plants in Uttar Pradesh.

Total PPA signed for cogeneration projects : 723.86 MW
Commissioned projects : 194.36 MW
Scheduled to commission in financial year 2006-07 : 352 MW
Scheduled to commission in financial year 2007-08 : 156 MW
Firms not responding to execute plants : 21.5 MW

S.N.	Name of Unit	Status of PPA	Contracted Capacity (MW)
1	SIAL-SBEC Bio Energy, Baraut, Baghpat Dist.	03.06.2005	14
2	Balrampur Chini Mills, Balrampur Dist.	28.8.2001	22.25
3	Simbholi Sugar Mills Ltd., Ghaziabad Dist.	04.03.2002	5
4	J.K. Sugar, Meerganj, Bareilly Dist.	29.8.2002	12.5
5	Dwarikesh Sugar Industries Ltd., Bijnor Dist.	26.9.2002	7.5
6	DSM Sugar, Rozagaon, Barabanki Dist.	15.11.2002	15
7	Haidergarh Chini Mills, Haidergarh, Barabanki Dist.	17.1.2003	17.95
8	Triveni Engineering & Industries Ltd., Deoband, Sharanpur Dist.	29.10.2003	19.16
9	DSCL, Ajbapur, Lakhimpur Kheri Dist.	05.10.2002 01.03.2006	12 12 (Addl)
10	Triveni Engineering & Industries Ltd., Khatauli, Muzaffarnagar Dist.	31.5.2005	20
11	L.H. Sugar Factories Ltd., Pilibhit	07.03.2005	12
12	Akbarpur Chini Mills, Akbarpur, Ambedkar Nagar Dist.	30.05.2005	11
13	Mawana Sugar Ltd., Mawana, Meerut Dist.	30.05.2005	9
14	Tikaula Sugar Mills Ltd., Muzaffarnagar	30.05.2005	5
15	Kamlapur Sugar & Industries Ltd., Kamlapur, Sitapur Dist.	08.04.2002	15
16	Bhandoria Power Ltd., Bhandoria, Bulandshahar Dist.	28.4.2004	6.5
17	Ramgarh Chini Mills, Ramgarh, Sitapur Dist.	26.6.2004	17
18	Mankapur Chini Mills, Gonda Dist.	10.11.2005	22
19	Ramgarh Chini Mills, Sitapur Dist	22.11.2005	16.35 (season) 23.85 (off season)
20	Ramgarh Chini Mills, Sahajahanpur Dist.	17.12.2005	16.35 (season) 23.85 (off season)
21	K.M. Sugar, Faizabad Dist.	04.01.2006	20
22	Awadh Sugar Mills, Hargaon, Sitapur Dist.	30.1.2006	20
23	Upper Ganges Sugar Mills, Bijnor Dist.	30.1.2006	13.5 (season)

			20.5 (off season)
24	Parle Biscuit Pvt. Ltd., Baharaich Dist.	06.2.2006	9.8
25	Mawana Sugar Ltd., Mawana, Meerut Dist.	10.02.2006	10 (Addl.)
26	Mawana Sugar Ltd., Titawi, Muzaffarnagar Dist.	10.02.2006	17
27	Mawana Sugar Ltd., Naglamal, Meerut Dist.	10.2.2006	11
28	Simbhaoli Sugar, Ghaziabad Dist.	25.02.2006	14 (Addl.)
29	DSCL Sugar, Loni, Hardoi Dist.	01.03.2006	15
30	DSCL Sugar, Hariyawan, Hardoi Dist	01.03.2006	15
31	Chilwaria Sugar, Bahraich Dist.	21.03.2006	19
32	L.H. Sugar, Pilibhit Dist.	07.04.2006	28
33	Tikaula Sugar Ltd., Muzaffarnagar Dist.	07.04.2006	5 (Addl.)
34	Triveni Engineering & Industries Ltd., Khatauli, Muzaffarnagar Dist.	07.04.2006	17 (Addl.)
35	Dhampur Sugar, Bjnor Dist.	07.04.2006	30
36	D SM Sugar, Asmauli, Muradabad Dist.	07.04.2006	30
37	D SM Sugar, Mansurpur, Muradabad Dist.	07.4.2006	20
38	Dwarikesh Sugar, Bijnor Dist.	28.4.2006	24
39	Dwarikesh Sugar, Bareilly Dist.	17.5.2006	24
40	Bajaj Hindustan Ltd., Kinauni, Meerut Dist.	14.06.2006	10 (Season) 12 (off season)
41	Bajaj Hindustan Ltd., Thana Bhawan, Muzaffarnagar Dist.	14.06.2006	10 (Season) 12 (off season)
42	Bajaj Hindustan Ltd., Bhaisana Bhudana, Muzaffarnagar Dist.	14.06.2006	20 (Season) 12 (off season)
43	Bajaj Hindustan Ltd., Bilai, Bijnor Dist.	14.06.2006	10 (Season) 12 (off season)
44	Bajaj Hindustan Ltd., Paliakalan, Lakhimpur Kheri Dist.	14.06.2006	12 (Season) 12 (off season)
45	Bajaj Hindustan Ltd., Khambharkhera, Lakhimpur Kheri Dist.	14.06.2006	12 (Season) 12 (off season)
46	Bajaj Hindustan Ltd., Varkhera, Pilibhit Dist.	14.06.2006	10 (Season) 12 (off season)
47	Bajaj Hindustan Ltd., Gangnoli, Saharanpur Dist.	14.06.2006	10 (Season) 12 (off season)

Source: Uttar Pradesh Cane Development Department, http://www.upcane.org/dist_ithano_3.htm

Appendix 4

List of Participants for Stakeholder Consultation

SN	Name	Designation	Organizatoin	Contact Information	Letter Sent/Received
1	Mr. A. K. Tanwar		Triveni Engineering and Industries Ltd.	12-A, Peenya Industrial Area, Peenya, Bangalore 560058	04.08.06
3	Ms. Rajshree Pathy	President	Indian Sugar Mills Association	Ansal Plaza, C-Block, 2nd Floor, Andrews Ganj, New Delhi	12.08.06
4	Mr. Ashok K Goel	President	Indian Sugar Mills Association	Ansal Plaza, C-Block, 2nd Floor, Andrews Ganj, New Delhi	12.08.06
5	Mr. C. S. Nopany	President	Indian Sugar Mills Association	Ansal Plaza, C-Block, 2nd Floor, Andrews Ganj, New Delhi	12.08.06
6			Shri Badri Kedar Paper Mills Ltd.	Nagina Road, Najibabad, Bijnor, UP	04.08.06
7			Sehkari Ganna Vikas Samiti Ltd.	Nagina, Bijnor, UP	04.08.06
8	Mr. Jitendra Singh	Gram Pradhan	Rajpura Village	P.O- Medhpurasultan-246 762, BIjnor, UP	04.08.06
9	Mr. Narendra Bhooshan	Executive Director	Udyog Bandhu	12-C, Mail Avenue, Lucknow	12.08.06
10	Mr. Ashok Kumar Khurana	Chairman	UP Power Corporation Limited	Shakti Bhawan, Extension 14, Ashok Marg, Lucknow	12.08.06
11	Ms. Omwati	M.L.A	Rooppur Village	P.O- Raja Ka Tajpur, Bijnor, UP	04.08.06
12	Munshi Ram Pal	M.P.	Nagina	Nagina, Bijnor, UP	04.08.06
13		The Executive Engineer	UP Power Corporation Limited	Najibabad, Bijnor, UP	04.08.06
14	Mr. Shanker Singh		Rajpura Gram	P.O- Medhpurasultan – 246 762 Bijnor, UP	04.08.06
15	Mr. Bhupendra Pal Singh		Bundki Gram	P.O- Medhpurasultan – 246 762 Bijnor, UP	04.08.06
16	Mr. Har Govind		Shyampur Gram	P.O- Medhpurasultan – 246 762 Bijnor, UP	04.08.06
17		Chairman	UP Electricity Regulatory	2nd Floor, Kisan Mandi Bhawan,	01.08.06

			Commission	Vibhuti Khand, Gomti Nagar, Lucknow 226001	
18	Mr. Vijoy Kumar		UP Electricity Regulatory Commission	2nd Floor, Kisan Mandi Bhawan, Vibhuti Khand, Gomti Nagar, Lucknow 226001	12.08.06
19		Member Secretary	Co-generation Association of India	C/o MSFCSF Ltd., 1st Floor, Sakhar Sankul, Shivajinagar, Pune-411005	01.08.06
20	Hon. Shri Sharad Pawar	Founder Chairman	Co-generation Association of India	C/o MSFCSF Ltd., 1st Floor, Sakhar Sankul, Shivajinagar, Pune-411005	12.08.06
21		Secretary	U.P. Sugar Mill Association	Chintal House, IV Floor, Room No.403, 16-Station Road Lucknow-226001	01.08.06
22	Mr. Madhav Prasad	Chairman	U.P. Sugar Mill Association	Chintal House, IV Floor, Room No.403, 16-Station Road Lucknow-226001	12.08.06
23		Secretary	U.P. Sugar Mills Co-gen Association	2/95, Vishal Khand, Gomti Nagar, Lucknow-226 101	01.08.06
24	Mr. Madhav Prasad	Chairman	U.P. Sugar Mills Co-gen Association	2/95, Vishal Khand, Gomti Nagar, Lucknow-226 101	12.08.06
25	Mr. Rajendra Singh Chauhan	Chairman	Uttar Pradesh Pollution Control Board	IIIrd floor, PICUP Bhawan, Vibhuti Khand, Gomti Nagar, Lucknow - 226 020	01.08.06
26	Mr. Sanjay Bhoosreddy	Director	Non-Conventional Energy Development Agency of Uttar Pradesh	Vibhuti Khand Gomati Nagar Lucknow 226 010	12.08.06
27		Director	Non-Conventional Energy Development Agency of Uttar Pradesh	Vibhuti Khand Gomati Nagar Lucknow 226 010	01.08.06