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

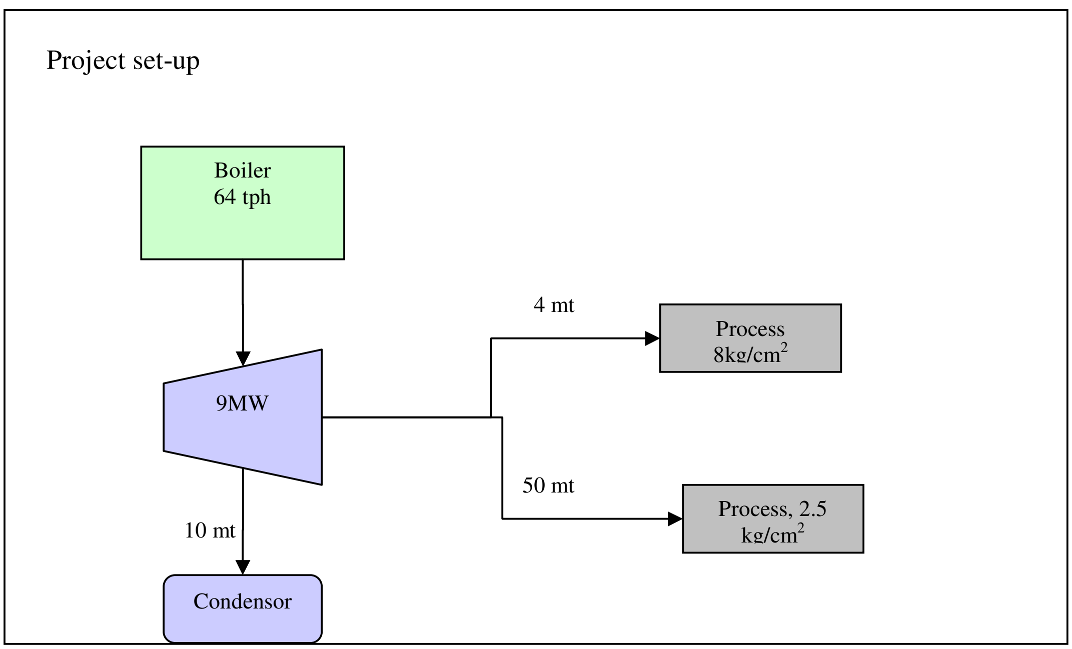
A.1 Title of the small-scale project activity:

>>
Nava Bharat RE Bagasse Project
29/12/2006
Version 1

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

>>
The proposed CDM project activity is an expansion of electricity generation capacity and the installation of facilities to export electricity at 33kV to the grid at the Nava Bharat sugar factory in Samalkot, Andhra Pradesh, India. The project activity consists of the installation of 9MW double extraction cum condensing turbine generator. The steam for operation of the turbine will be provided by the existing Thermax 43 kg/cm^2 pressure, 410±15^{o}C temperature, 64 tonnes per hour capacity boiler. The boiler and hence turbine generator will be powered by the combustion of bagasse, a co-product of the sugar production process and will therefore be a renewable carbon neutral source of electricity.

Earlier the power generation at the factory consisted of 2 turbine generators, one 2MW backpressure turbine (operating at 21 kg/cm^2) and one 3MW backpressure turbine (operating at 42kg/cm^2). These are replaced by the new turbine generator. The new generator will operate on the same boiler but utilise the steam generated in a more efficient manner. The pressure reducing station will no longer be used which again permits for greater efficiencies in the use of the steam generation. The following diagram shows the project set-up.



The new turbine generator will export electricity at 33kV and therefore there has also been an investment in a grid connection and lines were laid to the substation for the transfer of this electricity.

All modern sugar factories are energy independent, employing co-generation for their own steam and power requirements. However in the absence of financial incentives to sell surplus power, the technology chosen is low cost and inefficient. Typically this produces just enough energy for the plant's own consumption and this has been the case at the Nava Bharat sugar plant. However, given the right financial incentives investments can be made to improve the efficiency and capacity of power generation and with carbon assistance the mill is undertaking such an investment.

All sugar factories make a significant contribution to the sustainable development due to their rural location. In India about 70% of the population[1] is rural and the location and support of rural enterprises is therefore an important step in maintaining livelihoods. The benefits of registering the project as a CDM will indirectly benefit the farmers, of which there are 5,780 supplying the factory, through the returns the factory is able to achieve from the sale of electricity. Therefore cane will no longer be supplied solely for the manufacture of sugar but sugar and electricity.

Furthermore the factory carries out significant extension work in surrounding rural area, namely:

- Provides seed and fertiliser loans to farmers
- Provides farmers with a subsidy on pesticides
- Contributes 50% to the development of minor link roads and 75% for major link roads through the cane development council
- Provides bank guarantees for farmers who wish to develop irrigation projects and provides a subsidy for drip irrigation systems
- Provides advice on the adoption of new cane varieties which are tested at the factory farm

Finally access to secure and reliable electricity supplies is fundamental to development. The project activity will further contribute to sustainable development through the provision of this key input with the added benefit that the electricity is produced from a clean and renewable source which will lead to the displacement of fossil fuels. Displacing fossil fuel based generation will also have positive benefits relative to the alternative fossil fuels for the supply of electricity, especially a reduction in NOx, SOx and ash which arise in coal based generation (ash content of bagasse is of the order of 2-4% whilst Indian coal typically has an ash content of greater than 35%).

A.3. Project participants:

>>

Name of Party involved	**Private and/or public entity(ies) project participants (as applicable)**	**Kindly indicate if the Party involved wishes to be considered as a project participant**
India (host)	Nava Bharat Ventures Ltd	No
United Kingdom	Agrinergy Ltd	No

The official contact for the project activity will be Nava Bharat Ventures Ltd as listed in Annex I.

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[1] http://www.censusindia.net/

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

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

>>

A.4.1.1. Host Party(ies):

>>
India

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

>>
Andhra Pradesh State, East Godavari District

A.4.1.3. City/Town/Community etc:

>>
Samalkot

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

>>
The Nava Bharat Sugar plant is located at a distance of 1km from Samalkot train station in the East Godavari District of Andhra Pradesh. The postal address of the plant is:

Nava Bharat Ventures Ltd
Samalkot
East Godavari District
Andhra Pradesh 533440

The geographical location of Samalkot[2] is Latitude: 17.03N and Longitude: 82.13E.

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

>>
Type I – Renewable Energy Projects
I D - Grid connected renewable electricity generation

The technology adopted has been applied in other sugar factories in India. All the required guidelines will be met for compliance with local safety and environment legislation. Consents from state pollution board in the past demonstrate that the project proponents have followed these guidelines and all future consents will be based on any new guidelines specified by the pollution control board. The technology is available in India and the technical support/training may be provided by the manufacturer from time to time.

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

>>
A 7 years renewable crediting period has been chosen.

[2] http://www.mapsofindia.com/lat_long/andhrapradesh/andhrapradesh.htm

Years	Estimation of annual emission reductions in tonnes of CO_2e
Year 2007	16,893
Year 2008	16,893
Year 2009	16,893
Year 2010	16,893
Year 2011	16,893
Year 2012	16,893
Year 2013	16,893
Total estimated reductions (tonnes of CO_2e)	118,250
Total number of crediting years	7
Annual average of the estimated reductions over the crediting period (tCO_2e)	16,893

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

>>

No public funds will be invested in the project activity.

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

Appendix C, paragraph 2 of the Simplified Modalities and Procedures for Small-Scale CDM project activities states:

"A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM 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

As there is currently no registered CDM project at the site either large scale or small scale, the project will meet the criteria on debundling.

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:

>>

Type I – Renewable Energy Projects
I D – Grid connected renewable electricity generation
Version 10, 23 December 2006[3]

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

>>
The project activity will produce renewable energy from the combustion of bagasse. The plant will be connected to the 33kV grid and the electricity supplied from the project activity to the grid would be expected to displace existing and planned electricity generation from the grid, the majority of which is fossil fuel based. Therefore, it falls under the category as specified in section B.1.

The project activity installs a new turbine of 9MW, which therefore qualifies under the small scale rules as this is below the eligibility limit of 15MW. The project will remain under the small scale project activity during the applicable crediting period and this will be verified during the annual verifications.

B.3. Description of the project boundary:

>>
In line with the guidance in "Appendix B of the simplified modalities and procedures for small-scale CDM project activities" the boundary for category I.D. projects "encompasses the physical, geographical site of the renewable generation source".

The project boundary is drawn around the export of electrical power from the new turbine generator to the 33kV grid. Using bagasse to generate steam and electricity for process operations is standard procedure in most modern sugar factories, therefore power used by the factory is outside the boundary[4]. The export of electricity at 33kV is solely as a result of the project activity and a distinct boundary can be drawn around this activity.

The gases considered within the boundary are limited to carbon dioxide as the bagasse is not stored for any significant period of time that might give rise to methane emissions. We do not consider any methane that arises as a result of combustion of bagasse nor do we claim for any avoided methane from the decomposition of bagasse.

The boundary for the calculation of the grid carbon emissions factor is the Southern Region grid of India, this comprises the states of Andhra Pradesh, Karnataka, Tamil Nadu and Kerala and the Union Territories of Lakshadweep and Pondicherry.

In line with the methodology leakage does not need to be considered as we are not transferring equipment from another site.

B.4. Description of baseline and its development:

[3] http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

[4] Should a non-core facility, such as a distillery or stand-alone refinery, be subsequently installed, any power supplied to this from the project activity should qualify for CERs as under the baseline scenario, these units would import power from the grid. It should be noted that there are no plans for the installation of such units.

>>
Referring to Appendix B of the Simplified Baseline and Monitoring Methodologies we have chosen approach 9 (a) - A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002. We do not include power to the factory as our baseline assumes that sugar factories are power independent. In the specific case of the project activity, the baseline scenario is that the sugar factory remains self sufficient in power, and continues to export a small amount of electricity to the grid. That this is the case and that the project activity is not the baseline has been demonstrated in section B.5 through analysis of:

1. Project financials, the project activity is non-viable without the revenue from emission reductions;
2. Other barriers to the project which include uncertainty surrounding biomass availability, pricing and PPA risk.

The project activity will allow for exports of electricity to the grid, which will be metered and it is the volume of electricity that will qualify for emission reductions. The project set up does not allow for the combustion of coal or other fossil fuels.

The plant has exported a very small quantity of electricity to the grid in the past and therefore we must account for these in our baseline. The exports have taken place through a backpressure turbine and are therefore only possible during the season (when the factory is crushing cane). We therefore use the season to determine a 3 year historic average of the capacity exported. This is then incorporated into the baseline by deducting this from the qualifying exports of electricity to the grid.

To obtain the number of emission reductions generated, qualifying exports of electricity must be multiplied by the relevant CO_2 emission factor and any deductions made for project emissions. Thus:

$$ER_y = \lfloor E_y - \alpha . t \rfloor . CEF - PE_y$$

Where:

- ER_y Emission reductions in year y, tCO_2
- E_y Electricity exported to the grid in year y, MWh
- α Constant representing annual average MW exported, MW
- t Season length, hours
- CEF Constant representing the CO_2 emission factor of grid based electricity, tCO_2/MWh
- PE_y Project emissions, tCO_2

Table 2: Determination of baseline variables

Variable	Type	Comment
E_y	Total power exported to the grid	Basis of power that qualifies for emission reductions. MWh.
α	Average export capacity	Determined from historic exports of electricity from 2MW turbine generator
t	Season length	Applied to historic export capacity to reduce qualifying exports of electricity
CEF	Carbon dioxide emissions factor	The CO_2 emission factor that will be applied to qualifying exports to determine the emission

		reductions arising from the project.
PE_y	Project emissions	Any emissions that arise from the project activity

Determination of α
The factor α that reduces future exports is determined from a three year average of the historic exports and the operating hours. These data are shown in the following table.

Table 3: Determination of α

	2002/03	2003/04	2004/05
Exported power, kWh	1,434,870	3,841,690	741,850
Operation days	162	149	154
Average, MW	0.369	1.074	0.201

The average MW capacity exported is 0.548MW.

Determination of t
The time period t will be determined from the period that the factory crushes cane and could therefore export power through the existing backpressure turbine generator.

Determination of CEF
Detailed in Annex 3.

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:

In line with attachment A to appendix B of the simplified M&P for small-scale CDM project activities, demonstration of additionality focuses on the barriers facing the project.

We undertake additionality analysis through an investment scenario analysis of the project and then turn to examine other barriers facing the project. We examine the financials of the project with and without emission reduction revenue, highlighting the importance of emission reduction revenue to the viability of the project. This analysis is supplemented with information on other barriers the project has faced and how the prospect of CER revenue will allow these to be overcome – in particular operational and institutional barriers to the up-take of bagasse cogeneration.

a) Financial barriers:
The financial risks relate to the pricing of the main input, bagasse and the only output (aside from carbon credit revenues) electricity. The trends and risks in these inputs and outputs are covered in the next section but we have presented a financial analysis of the project with and without carbon credit revenues.

The equity IRR increases from 8.35% to 18.72% with the inclusion of carbon credit revenues. This assumes a final price of carbon credits of 10 Euro per tonne based on current discounted spot prices trading in the European market. The assumptions underlying the analysis will be made available at the time of validation but we assume a bagasse price of Rs 950/mt and a season length of 150 days and off-season of 75 days. These assumptions are conservative given that bagasse prices last year were Rs 1041/mt and the factory operated for 154 days. Other assumptions are standard, such as operation, maintenance and salaries, which we assume will be 2.5% of the investment costs.

b) Other barriers:
Risks in the pricing of bagasse are a substantial barrier to the project activity. The factory has the option to sell bagasse on the open market, and bagasse prices have exhibited volatility in the recent past. (As indicated above the actual price of bagasse in the year 2004/5 was Rs 1041/tonne). High opportunity values for bagasse will make the project activity unviable. Allied to the volatility of bagasse prices is the availability of bagasse. Should yields of sugarcane fall (dependent on rainfall[5]) and thus bagasse supply from the unit be reduced the factory will not be able to run for the expected 75 days in the off-season and season generation will be shortened, both of these factors will impact power generation and the financial viability of the project.

A second barrier that has faced the project activity is the uncertainty surrounding the PPA. Although the tariff is governed by the State Electricity Regulatory Commission the recent reforms to the state generation/distribution and transmission companies pose a risk to the project. Typically the generation, distribution and transmission companies have been integrated state concerns, however recent reforms have de-bundled these companies and separated out the individual functions. Whilst this provides a more market based system it has increased the counterparty risk for suppliers of power given that the individual distribution companies have a smaller balance sheet and less financial credibility.

More generally the barriers inherent in bagasse cogeneration projects are highlighted by the lack of projects that have emerged successfully. India is the largest cane producer in the world, with over 450 factories, and whilst there is the capacity to export 4000 to 5000MW, only about 450MW is currently grid connected.[6]

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

>>
As explained in section B.4 we arrive at the emission reductions due to the project activity using the following equation:

$$ER_y = \lfloor E_y - \alpha.t \rfloor CEF - PE_y$$

Where:

ER_y	Emission reductions in year y, tCO_2
E_y	Electricity exported to the grid in year y, MWh
α	Constant representing annual average MW exported, MW
t	Season length, hours
CEF	Constant representing the CO_2 emission factor of grid based electricity, tCO_2/MWh
PE_y	Project emissions, tCO_2

[5] "The economics of sugar in India are more complicated than those of sugar industries in many other countries. Both area and production of sugarcane fluctuate considerably from year to year. This is due to variations in climatic conditions, the vulnerability of areas cultivated under rainfed conditions, fluctuations in prices of gur and khandsari, and changes in returns from competing crops." Source: FAO.

[6] Presentation of S V Shiralkar, MITCON: "Experience Sharing on Grid Connected Bagasse Based Cogeneration in India" from Cogeneration Association of India's Brazil Mission, Sept-Oct 2003.

Project Emissions
As no fossil fuel is fired and no biomass is transported to the project site from outside, project emissions PE_y are not considered.

Therefore, the above equation reduces to:

$$ER_y = \lfloor E_y - \alpha.t \rfloor .CEF$$

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

(Copy this table for each data and parameter)

Data / Parameter:	$F_{i,j,y}$
Data unit:	Mt, mcbm, kl
Description:	Consumption of fossil fuel by existing grid connected power plants
Source of data used:	Central Electricity Authority
Value applied:	Varies for each plant
Justification of the choice of data or description of measurement methods and procedures actually applied :	For thermal power plants the CEA provides coal consumption data for each grid based unit, whilst for gas based plants aggregate fuel consumption data is available. The choice of data therefore satisfies the guidance in the methodology, ACM0002.
Any comment:	Full data set provided in Annex 3

Data / Parameter:	$GEN_{j,y}$
Data unit:	GWh
Description:	Generation of electricity by existing grid connected power plants
Source of data used:	Central Electricity Authority
Value applied:	Varies for each plant
Justification of the choice of data or description of measurement methods and procedures actually applied :	The CEA provides data on the generation of electricity by grid based units.
Any comment:	Full data set provided in Annex 3

Data / Parameter:	NCV_i
Data unit:	TJ/kt
Description:	Net calorific value of the fuel combusted in grid based power plants used in the determination of the emission factor
Source of data used:	India's National communication to UNFCCC
Value applied:	Varies for each fuel type
Justification of the choice of data or description of	India specific values. Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC, 1996) has been used for a transparent and comparable emission inventory.

measurement methods and procedures actually applied :	
Any comment:	Full data set provided in Annex 3

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tCO2/TJ
Description:	Tonnes of carbon dioxide per energy unit of fuel in grid based plants used in the determination of the emission factor
Source of data used:	India's National communication to UNFCCC
Value applied:	Varies for each fuel type
Justification of the choice of data or description of measurement methods and procedures actually applied :	India specific values. Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC, 1996) has been used for a transparent and comparable emission inventory.
Any comment:	Full data set provided in Annex 3

Data / Parameter:	$OXID_i$
Data unit:	%
Description:	Oxidation factor applied to the combustion of fuels in grid based plants for the determination of the emission factor
Source of data used:	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual Table 1-6
Value applied:	98% for coal and 99.5% for gas
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	No comments

Data / Parameter:	$F_{i,m,y}$
Data unit:	Mt, mcbm, kl
Description:	Consumption of fossil fuel by existing grid connected power plants
Source of data used:	Central Electricity Authority
Value applied:	Varies for each plant
Justification of the choice of data or description of measurement methods and procedures actually applied :	For thermal power plants the CEA provides coal consumption data for each grid based unit, whilst for gas based plants aggregate fuel consumption data is available. The choice of data therefore satisfies the guidance in the methodology, ACM0002.

Any comment:	Full data set provided in Annex 3

Data / Parameter:	**$GEN_{m,y}$**
Data unit:	GWh
Description:	Generation of electricity by existing grid connected power plants
Source of data used:	Central Electricity Authority
Value applied:	Varies for each plant
Justification of the choice of data or description of measurement methods and procedures actually applied :	The CEA provides data on the generation of electricity by grid based units.
Any comment:	Full data set provided in Annex 3

Data / Parameter:	**α**
Data unit:	MW
Description:	Historical export of electricity to the grid
Source of data used:	Plant records
Value applied:	0.548MW
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data for exported electricity has been recorded on a daily basis in the last three years.
Any comment:	Details in Section B.4

B.6.3 Ex-ante calculation of emission reductions:

>>

As outlined in section B.6.1, the emissions reductions are calculated using the following equation:

$$ER_y = \lfloor E_y - \alpha . t \rfloor CEF$$

Using the following values for the variables in above equation:

E_y = 20,196MWh
α = 0.55MW
t = 150 days * 24 hours
CEF = 0.927 tCO_2/MWh

Therefore, putting these values in the above equation gives annual emissions reductions as:

ER_y = 16,893 tCO_2e

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

>>

Year	Estimation of project activity emissions (tCO_2e)	Estimation of baseline emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of overall emission reductions (tCO_2e)
Year 2007	0	16,893	0	16,893
Year 2008	0	16,893	0	16,893
Year 2009	0	16,893	0	16,893
Year 2010	0	16,893	0	16,893
Year 2011	0	16,893	0	16,893
Year 2012	0	16,893	0	16,893
Year 2013	0	16,893	0	16,893
Total (tonnes of CO_2e)	0	118,250	0	118,250

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:	**E_y**
Data unit:	MWh
Description:	Units exported to the grid
Source of data to be used:	Plant records
Value of data	20,196MWh
Description of measurement methods and procedures to be applied:	This parameter will be measured daily using electronic measurement meters at the power plant. The data will be kept for 2 years after the end of the crediting period.
QA/QC procedures to be applied:	The meter reading will be cross-checked with the sales receipts of electricity and if necessary a energy balance may be conducted annually to further check the data.
Any comment:	

Data / Parameter:	**t**
Data unit:	hours
Description:	Season days multiplied by hours
Source of data to be used:	Plant records
Value of data	3600 hours
Description of measurement methods	This parameter is needed to determine the length of the season and can be obtained by finding out the start and the end date of the crushing season.

and procedures to be applied:	
QA/QC procedures to be applied:	No necessary for this parameter
Any comment:	

B.7.2 Description of the monitoring plan:

>>

The CDM project data will be collected monthly and will then be collated through the use of the attached spreadsheet tool which has been designed for the project activity. This will permit the monitoring and reporting of emission reductions on a monthly basis.

The generation data from the turbine will however be continuously recorded by current transformers and a manual hourly record will be made by the turbine operator. This data will be collated at the end of each day and reported in the daily operating report to the factory management, the responsibility for which will be with the Manager (Power Plant). This data will form the basis of the ongoing calculation which will then be tallied against the monthly recordings taken by the APEPDCL and a representative of the project activity.

The plant will implement a PLC(Programmable Logic Counter) system which will electronically monitor the main performance and output variables of the power plant, the systems for monitoring the CDM aspect of the project will draw extensively from the PLC system.

MVP - ***to be completed monthly***

Data in blue should be entered by project administrator in a timely manner, data in yellow is fixed.

Static data	
CEF, tonnes CO2e/MWh	0.927
Adjustment, MW	0.548

	2007/08	**2008/09**	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Season										
Start date										
End date										
Hours	0	0	0	0	0	0	0	0	0	0
Electricity exports MWh										
Apr										
May										
Jun										
July										
Aug										
Sep										
Oct										
Nov										
Dec										
Jan										
Feb										
March										
Total exports	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grid adjustment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mass of fossil fuel, t										
Project emissions										
CERs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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: 09/09/2005
Robert Taylor, Agrinergy Ltd, contact information as listed in annex I.
N. Subash Chandra, Nava Bharat Ventures Ltd, Sugar Division (Samalkot A.P), project participant as listed in Annex I.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
12/08/2004.
On this date the turbine generator was ordered. The project has considered CDM revenues ever since it was at the planning stage, initial discussions took place between the promoter and CDM developer in August 2003 and documentary evidence to this effect will be provided to the designated operational entity.

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

>>
20 years

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

A renewable crediting period is chosen.

C.2.1. Renewable crediting period

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

>>
01/04/2007 or the date of registration 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:

>>
Not Applicable

C.2.2.2. Length:

>>
Not Applicable

SECTION D. Environmental impacts

>>

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

>>
In relation to the baseline scenario no negative environmental impacts will arise as a result of the project activity.

The positive environmental impacts arising from the project activity are:

- A reduction in carbon dioxide emissions from the replacement of fossil fuels which would be generated under the baseline scenario
- A reduction in the emissions of other harmful gases (NOx and SOx) that arise from the combustion of coal in power generation
- A reduction in the production of ash as bagasse has a lower ash content[7] than that of Indian coal which typically has an ash content of 30 to 40%

The Nava Bharat Sugar factory meets all environmental guidelines and regulations as set out by the regional and national environmental agencies. The Approval to Operate from the State Pollution Control Board and annual Consent to Operate highlight the compliance of the factory with environmental legislation. These consents will be part of the monitoring plan and thus ensure that the factory is in compliance. The two main pieces of legislation relating to the power plant will be

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:

>>
The 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 review has been conducted on three levels:

A local stakeholder review
A national stakeholder review which will be undertaken through the approval by the Ministry of Environment and Forests (the Indian DNA) and consent to operate from the Andhra Pradesh Pollution Control Board.
An international stakeholder review which will be conducted at the time of validation.

[7] The ash content on bagasse is normally 2%.

A notice was placed in Andhra Jyothi (Telgu) and Deccan Chronicle (English) news papers on 16th December, 2006 informing the local stakeholders about the project activity.

Other stakeholders that have been consulted are the Andhra Pradesh Pollution Control Board from which regulatory approvals and consents have been obtained, as detailed in section D, and the Andhra Pradesh Eastern Distribution Company who is counterparty to the PPA

E.2. Summary of the comments received:

>>
To date no comments have been received.

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

>>
As no comments were received, no action has been taken in this regard.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Nava Bharat Ventures Limited
Street/P.O.Box:	East Godavari District
Building:	
City:	Samalkot
State/Region:	Andhra Pradesh
Postfix/ZIP:	533 440
Country:	INDIA
Telephone:	0884 2327384
FAX:	0884 2327587
E-Mail:	nsc@deccansugars.in
URL:	
Represented by:	
Title:	Mr.
Salutation:	
Last Name:	Chandra
Middle Name:	
First Name:	Subas
Department:	Commercial
Mobile:	098 498 27272
Direct FAX:	
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The project has not received any public funding.

Annex 3

BASELINE INFORMATION

In line with the methodology to calculate the baseline emissions we use the relevant sections of ACM0002 (Consolidated baseline methodology for grid-connected electricity generation from renewable sources). The combined margin presented below consists of the calculation of the average of the Operating Margin (OM) and the Build Margin (BM). In calculating the operating margin, we select the Simple OM option. Whilst Dispatch Data Analysis is the preferred method of calculating the OM, this is not selected because the required dispatch order data are not available in India. If low-cost/must run resources constitute less than 50% of total grid generation we have the option of using Simple OM.

The first step therefore in selecting the Simple OM is to show that the proportion of low-cost/must run resources are less than 50% of total generation in the average of the last 4 years of data[8]. Low cost/must-run resources typically include hydro, geothermal, wind/ low cost biomass nuclear and solar generation. In addition, we must consider the possibility that coal is obviously used as must-run. In the Southern Region, the marginal costs of generation from coal are above those of renewable sources such as hydro, wind, nuclear and low-cost biomass. Moreover, coal plants have the possibility to "ramp-up" and "ramp-down". We therefore conclude that coal generation is not an obvious must-run resource. Low-cost/must run resources identified are therefore restricted to hydro and nuclear (the CEA does not provide any generation data from low-cost biomass and wind resources in the Southern Region). The following table clearly demonstrates the low percentage that low-cost/must run sources constitute of total generation and therefore confirms the choice of Simple OM.

Units operating in the Southern Region

	2005-6 Generation, GWh	2004-5 Generation, GWh	2003-4 Generation, GWh	2002-3 Generation, GWh
Thermal	108244.10	112629.58	116072	112306
Nuclear	4712.99	4406.73	4700	4390
Hydro	33505.56	25279.78	16670	18465
Hydro/nuclear as % of total	20.4	20.85	15.54	16.9

Source: CEA Generation report, http://www.cea.nic.in/god/opm/Monthly_Generation_Report/18col_05_03.pdf#sear

The calculation of the Simple OM initially requires us to calculate a CO_2 emission coefficient for thermal power plants based on the type of fuel used.

As per the methodology, the CO2 emission coefficient $COEF_i$ is obtained from the following equation:

$$COEF_i = NCV_i . EF_{CO2,i} . OXID_i$$

[8] We have used a 4 year average as data for 5 years generation is not available, see http://www.cea.nic.in/god/opm/Monthly_Generation_Report/index_Monthly_Generation_Report.html

Where:

NCV_i is the net calorific value (energy content) per mass unit of a fuel i,
$OXID_i$ is the oxidation factor of the fuel,
$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel i.

In line with the methodology where available, local values of NCV_i and $EF_{CO2,i}$ should be used. If no such values are available, country-specific values should be used. The following table shows the NCV and EF factors used in the calculation of the Southern Region emission factor.

Factors used in calculation of the CO2 emission coefficient

	NCVi,		OXIDi, %		EFCO2,i, tC/TJ	
	Factor	Source	Factor	Source	Factor	Source
Coal	19.23 TJ/kt	India's National Communication to the UNFCCC,2004	98	IPCC	26.13	India's National Communication to the UNFCCC, 2004
Gas	37.68 TJ/cbm	Gail and IPCC[9]	99.5	IPCC	15.3	IPCC
HSD	43.33	IPCC	99	IPCC	20.2	IPCC
Naptha	45.01	IPCC	99	IPCC	20	IPCC
Lignite	9.29	India's initial national communication to the UNFCCC, 2004 (lower bound)[10]	98	IPCC	28.95	India's initial national communication to the UNFCCC, 2004

ACM0002 states "Plant emission factors used for the calculation of operating and build margin emission factors should be obtained in the following priority:

1. Acquired directly from the dispatch center or power producers, if available; or
2. calculated, if data on fuel type, fuel emission factor, fuel input and power output can be obtained for each plant; if confidential data available from the relevant host Party authority are used the calculation carried out by the project participants shall be verified by the DOE and the CDM-PDD may only show the resultant carbon emission factor and the corresponding list of plants.
3. calculated, as above, but using estimates such as: default IPCC values from the IPCC 1996 Revised Guidelines and the IPCC Good Practice Guidance for net calorific values and carbon emission factors for fuels instead of plant-specific values (note that the IPCC Good Practice Guidance includes some updates from the IPCC 1996 Revised Guidelines); technology provider's name plate power plant efficiency or the anticipated energy efficiency documented in official sources (instead of calculating it from fuel consumption and power output). This is likely to be a conservative estimate, because under actual operating conditions plants usually have lower efficiencies and higher emissions than name plate performance would imply; conservative

[9] http://www.gailonline.com/customerzone/power.htm. NCV 90% of GCV.

[10] This is lower than IPCC value for Lignite of 9.8

estimates of power plant efficiencies, based on expert judgments on the basis of the plant's technology, size and commissioning date; or

4. calculated, for the simple OM and the average OM, using aggregated generation and fuel consumption data, in cases where more disaggregated data is not available."

In India, the CEA is not a dispatch centre, and therefore Option 1 above cannot be done. Option 2 can be taken in so far as the CEA does provide coal consumption data for each plant. However the CEA does not provide coal NCV figures for each plant and therefore IPCC data has been used.

In the case of gas stations, individual fuel consumption for each plant is not available. Aggregate consumption at the state and regional level is instead provided by the CEA. These data are only available for 2003-4 and therefore we use these data to derive an average emission factor for gas stations in the Southern Region. The average emission factor is then applied to 2004-05 generation in the calculation of the CM[11].

The data on fuel consumption and generation for gas stations in the Southern Region is outlined below:

Fuel Consumption and generation from gas stations in the Southern Region, 2004-05

State	Natural gas consumption (mcbm)	HSD consumptio n (kl)	Naptha consumptio n (kl)	Total Generatio n (GWh)
Andhra Pradesh	1560	9298	0	6932.84
Karnataka	0	0	154061	909.86
Kerala	0	199	172241	1039.87
Tamil Nadu	384	226525	23972	2938.06
Lakshadweep	0	0	0	0
Pondicherry	66	0	0	275.42
Central	0	257	369420	2117.97
				14214.

Source: CEA General Review 2005, Table 6.1, pp. 117

These data are combined with the above data on fuel specific gravities, calorific values, emission factors and oxidation factors to determine total emission from the above gas stations:

Total emissions from gas stations in Southern Region, 2004-05

State	Emission from natural gas (tCO_2)	Emission s from HSD (tCO_2)	Emissions from Naptha (tCO_2)	Total Emission s (tCO_2)
Andhra Pradesh	3483137	25433	0	3508570
Karnataka	0	0	383527	383527
Kerala	0	544	428785	429329
Tamil Nadu	857388	619617	59677	1536681
Lakshadweep	0	0	0	0

[11] Steam stations use coal but gas may be also used as auxiliary fuel at these stations. The volume used is small and exclusion of this gas from fuel consumption calculation is conservative.

Pondicherry	147363	0	0	147363
Central	0	703	919651	920354
Total				6925824

Dividing total emissions by total generation from gas stations gives an average emission factor for gas stations in the Southern Region of 0.487tCO2/MWh.

Similarly, in the case of lignite stations, individual fuel consumption for each plant is not available from the CEA. As above, lignite consumption in steam stations is provided in the CEA General Review 2006.

Lignite consumption, generation and emissions in Southern Region, 2004-05

State	Lignite Consumption	Emissions	Generation
04/05 (Total)	20755	20172299.2	17791

Source: CEA General Review 2005

Dividing total emissions from lignite stations by generation gives an average emission factor for lignite stations of 1.13tCO_2/MWh.

Annual generation data for each power plant in the Southern Region is provided by the CEA[12]. (http://cea.nic.in/god/opm/Monthly_Generation_Report/18col_05_03.pdf).

Coal consumption data for thermal power plants is also provided by the CEA report "Performance Review of Thermal Power Stations". (http://cea.nic.in/Th_per_rev/start.pdf). The CEA year runs from April to March.

Net imports from connected grid systems must also be considered. As outlined in ACM002, net imports from connected systems are only accounted for in the Operating Margin calculation. In terms of the applicable emissions factor, ACM002 states that:
"For the purpose of determining the Operating Margin (OM) emission factor, as described below, use one of the following options to determine the CO2 emission factor(s) for net electricity imports (COEFi,j,imports) from a connected electricity system within the same host country(ies):

a) 0 tCO2/MWh, or
b) (b) the emission factor(s) of the specific power plant(s) from which electricity is imported, if and only if the specific plants are clearly known, or
c) (c) the average emission rate of the exporting grid, if and only if net imports do not exceed 20% of total generation in the project electricity system, or
d) (d) the emission factor of the exporting grid, determined as described in steps 1,2 and 3 below, if net imports exceed 20% of the total generation in the project electricity system."

Net imports from other regional grids account for less than 20% of total generation and therefore the average
emission rate of the exporting grid may be selected. The determination of the carbon emissions factors for the
exporting grids is based on an average grid emission rate as outlined in the methodology. The following tables outline the net import data and the emission factors for each grid:

[12] http://cea.nic.in/god/opm/Monthly_Generation_Report/18col_05_03.pdf and http://cea.nic.in/god/opm/Monthly_Generation_Report/18col_04_03.htm

Net Imports from Other Regional Grids to the Southern Region (GWh)

	2004/05	2003/04	2002/03
From Northern	0.0000	13.1000	0.0000
From Western	0	0	541
From Eastern	286	0	0
From N Eastern	0	0	0

Source: http://cea.nic.in/god/gmd/Inter-regional_Energy_Exchanges.pdf

Average emission rates for other Regional Grids (tCO2/MWh)

	2004/05	2003/04	2002/03
Northern CEF	0.8429	0.8138	0.8330
Western CEF	1.1393	1.1367	1.138968
N Eastern CEF	0.370257	0.424017	0
Eastern CEF	1.2183	1.23	1.1655

Calculated using average emission factors of exporting grids

Combining the above emission factors for coal and gas based stations and imports, with generation data (and in the case of coal plants fuel consumption data) from the CEA provides the following[13]:

[13] It should be noted that the CEA also provide data on specific secondary fuel oil consumption in coal plants. For conservativeness we have no included these emissions in calculation of the OM and BM.

Calculation of the Simple OM

	Coal Consumption (kt) 2004-05	Coal Consumption (kt) 2003-04	Coal Consumption (kt) 2002-03	Emissions (tCO2) 2004-05	Emissions (tCO2) 2003-04	Emissions (tCO2) 2002-03	Generation GWh 04-2005	Generation GWh 2003-04	Generation GWh 2002-03
Coal Plants									
ANDHRA PRADESH									
K'Gunden	3617	3395	3839	6531	6129	6931.69	5363	4183	4999
K'Gunden new	2699	2533	2865	4874	4574	5172.90	4141	3994	3730
Vijawada	6863	7161	7227	12392	12930	13048.91	9849	10104	10288
R'Gunden	317	312	272	572	563	491.12	496	471	390
Nellore	150	148	157	271	267	283.48	154	146	147
Rayal Seema	2149	2246	2300	3880	4055	4152.83	3354	3331	3488
R'Gunden STPS	10490	10167	10452	18941	18357	18871.90	17170	16332	16839
Simhadri	5556	5231	3428	10032	9445	6189.52	8122	7722	4979
KARNATAKA									
Raichur	6923	6982	6613	12500	12607	11940.29	10718	11400	10290
TAMIL NADU									
Ennore	1156	1186	1663	2087	2141	3002.68	1223	1258	1747
Tuticorin	5563	5292	5053	10044	9555	9123.58	8180	8084	8187
Mettur	4852	4918	4846	8761	8880	8749.83	6684	6735	6739
North Chennai	2816	3086	3276	5085	5572	5915.07	3916	4347	4405
Gas Plants									
ANDHRA PRADESH									
Vijeswaran GT				971	1046	990	1993	2147	2031
Peddapuram CCGT				556	609	414	1141	1249	850
Jegurupadu GT				692	733	771	1420	1505	1583
Kondapalli GT				1095	1090	1207	2246	2238	2477
Godavari GT				669	536	609	1373	1100	1250
KERALA									
Cochin CCGT				54	483	149	112	991	305

Kayam Kulam GT	302	1032	1036	621	2118	2127
KARNATAKA						
Tanir Bavi	307	795	624	630	1631	1280
TAMIL NADU						
Basin Bridge GT	20	43	134	41	89	276
Nariman GT	0	0	0	0	0	0
Valuthur GT	272	327	51	558	671	104
Kuttalam GT	312	53	0	641	108	0
Kovikalappal	372	363	354	763	745	726
Karuppar GT	0	0	0	0	0	0
P Nallur CCGT	226	640	1057	464	1314	2169
Valantharvi GT	0	0	0			
PONDICHERRY						
Karaikal	134	135	129	276	277	265
Diesel Plants						
ANDHRA PRADESH						
LVS Power DG	133	0	1	246	0	2
KERALA						
Bramhapuram DG	74	144	145	136	266	267
Kojikode DG	87	170	209	161	313	385
Kasargode DG	9	42	80	16	78	148
KARNATAKA						
Yelhanka DG	147	208	387	271	384	715
Bellary DG	22	23	35	40	42	64
Belgaum DG	129	127	192	238	235	355
TAMIL NADU						
Samayanallur DG	207	248	319	382	457	589
Samalpatti DG	194	248	338	357	458	623
B. Bridge DG	413	537	655	762	992	1209
LAKSHADWEEP						
Laksh DG	13	0	0	23	0	0

Others						
KARNATAKA						
Torangallu - coal, blast furnace gas	0	0	0	516	766	872
TAMIL NADU						
Neyveli TPS	1515	1582	460	1336	1395	406
Neyveli ST I	4828	4989	5013	4258	4400	4421
Neyveli ST II	10485	11342	11900	9247	10003	10495
Neyveli FST Ext	3671	2260	101	3238	1993	89
IMPORTS						
From Northern	0	11	0	0	13	0.00
From Western	0	0	616.52	0	0	541.30
From Eastern	349	0	0	286	0	0.00
From N Eastern	0	0	0	0	0	0.00
Totals	124225	132850	126806	117020	120684	115009
Simple OM	**1.103**	**1.101**	**1.097**			
Average Simple OM			**1.100**			

The final Simple OM, $EF_{OM, y}$, based on the average of the last three years for which data is available is therefore 1.100tCO_2/MWh.

In considering the BM we are required to calculate the carbon emissions factor based on an examination of recent capacity additions to the Southern region grid. These capacity additions should be chosen from the greater generation accounted for:

- The five power plants that have been built most recently, or
- The power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

The total generation of the grid under consideration is 14,9975 GWh, (http://cea.nic.in/god/opm/Monthly_Generation_Report/18col_05_03.pdf) 20% of which is 29,995 GWh. The five most recent plants only account for 317.29 GWh and therefore the sample to determine the build margin is selected on the basis of the "power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently". The full set of generating plants in the Southern Region is provided by the CEA generation report (http://cea.nic.in/god/opm/Monthly_Generation_Report/18col_05_03.pdf).

Commissioning dates for all generation units included in the CEA generation report have been obtained. The following table shows in chronological order the commissioning dates for the most recent 20% of commissioned plants and the total generation they supply. For the plants commissioned during 2005 and early 2006 some of the data is not available on the commissioning date, however given that the determination of the sample size includes all these plants their exact order of commissioning is immaterial to the calculation.

The calculation of the BM requires us to undertake a generation weighted average of the emissions factors of the individual plants, this is shown in the following table. We have chosen to calculate the BM using Option 1 therefore the BM emission factor will be held constant over the crediting period chosen.

Identification of plants in BM

Plant	Capacity addition, MW	Date of addition	Generation, GWh	Emissions, tCO2
Kadra	150	7/1/1999	230.98	0
Kodasali	120	7/1/1999	214.76	0
Kaiga	220	7/1/1999	1463.125	0
Harangi	9	7/19/1999	0	0
Singur	7.5	11/5/1999	0.735	0
Kojikode	128.8	11/6/1999	160.5	87
Torangallu	130	12/15/1999	258.165	0
Karaikal	32.5	1/3/2000	275.69	134
Singur	7.5	3/31/2000	0.735	0
Bellary DG	25.2	5/15/2000	40.32	22
Kondapalli	350	7/1/2000	2246.34	1095
Kayam Kulam GT	350	7/1/2000	620.5	302

Kaiga	220	9/26/2000	1463.125	0
Kovilkalappal	107	9/30/2000	763.32	372
Kuttiadi	50	1/27/2001	148.216	0
Kasargode DG	21.9	3/15/2001	15.74	9
Srisailam LB	150	4/26/2001	235.28333	0
Pillaiperumal Nallur	330.5	4/26/2001	464.3	226
Tani Bavi	220	5/15/2001	629.55	307
Kuthungal	21	7/1/2001	36.18	0
Gerusuppa	240	7/1/2001	437.59	0
Belgaum DG	81.3	7/1/2001	238.46	129
Madhavamantri	3	7/15/2001	22.86	0
Samalpatti	105.7	7/15/2001	357.33	194
Samayanallur DG	106	9/22/2001	382.02	207
Srisailam LB	150	11/12/2001	235.28333	0
Peddapuram	140	11/30/2001	726.30727	354
Peddapuram	80	11/30/2001	415.03273	202
LVS	36.8	1/15/2002	0	0
Simhadri	500	2/15/2002	4061.05	5146
Srisailam LB	150	4/19/2002	235.28333	0
Simhadri	500	8/15/2002	4061.05	5146
Neyveli Extn	210	9/15/2002	1618.84	1836
Srisailam LB	150	11/29/2002	235.28333	0
Raichur	210	12/10/2002	1531.1329	1832
Neyveli	250	12/16/2002	1335.82	1515
Valuthur GT	60	12/24/2002	352.10526	172
Valuthur GT	35	3/13/2003	205.39474	100
Neyveli Extn	210	3/15/2003	1618.84	1836
Srisailam LB	150	3/28/2003	235.28333	0
Srisailam LB	150	9/4/2003	235.28333	0
Kuttalam GT	64	11/30/2003	410.1632	200
Chembukadavu	6.5	12/30/2003	6.19	0
Urumi	6.2	12/30/2003	0.91	0
Mini Hydel	7.6	1/1/2004	5.2615385	0
Kuttalam GT	36	3/30/2004	230.7168	112

Malankara	10.5	5/30/2004	2.95	0
Karuppur	119.8	2/9/2005	0	0
Almatti DPH	125	7/30/2005	138.68	0
Ramagundam STPS	500	3/25/2005		0
Totals			28603	21532
BM				**0.753**

Source: CEA, state electricity board and NTPC website. Emission factors are the same as used in the OM,.

The weights applied to the operating and build margin are fixed at 0.5, therefore in order to calculate the combined margin we apply these to the Simple OM and BM as calculated above. The following table shows this calculation arriving at the combined margin of 0.927tCO_2/MWh.

Table 14: Calculation of the combined margin

	tCO_2/MWh
Simple OM, $EF_{OM, y}$	1.100
Build margin $EF_{BM, y}$	0.753
Combined margin, EF_y	0.927

Annex 4

MONITORING INFORMATION

This section has been left blank on purpose.

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