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

CONTENTS

SECTION A. General description of project activity

A.1 Title of the project activity:

Venkateshwara Power Project Ltd. (VPPL) bagasse based co-generation project

A.2. Description of the project activity:

The main objective of the project activity is to effectively utilize the available bagasse generated by the VPPL sugar production mill for generation of steam and electricity. This will be used for both in-house consumption and to export surplus electricity to the grid. The power is exported to the Karnataka State Electricity Board (KSEB) in the Southern Regional Grid – India. Given the power situation of the state of Karnataka which indicates that there is a shortage in the peak demand, this demands the necessity for the state to tap every possible alternate source of energy from biomass or renewable type of fuels.

Venkateshwara Power Project Ltd. (VPPL) is a sugar factory having three boilers in operation, and seven turbines. There are four turbines primary turbines that are used for steam and power production, and three other turbines used for backup in case of emergencies during the crushing season. The boilers in operation consist of, two low pressure boilers of 21 kg/cm^2 at 52 TPH and 28 TPH, and one high pressure boiler of 65 kg/cm^2 pressure at 70 TPH. The primary turbines in operation are one 8 MW back pressure turbine and three others rated at 1.8 MW back pressure turbine. The existing power plant configuration is outlined bellow.

Turbines Nos. – Turbo Generators (T.G)	Rated Capacity (MW)	Actual Power Generated (MW)	Total Power Generated (MW)	Captive Power Generated (MW)	Export Power Generated (MW)
T.G - 7	8	4.5	7.8	5.08	2.72
T.G – 6	1.8	1.1			
T.G – 5	1.8	1.1			
T.G – 4	1.8	1.1			
T.G – 3	1.8	Used for Back-up			
T.G – 2	1.2	Used for Back-up			
T.G – 1	1.2	Used for Back-up			

Venkateshwara Power Project Ltd. (VPPL) is a public limited company formed mainly for producing sugar as well as generation of power with a low cost technology using bagasse. Considering the growth in the sugar industry in the region in last five decades, the promoters have decided to expand the crushing capacity of the sugar plant. As a result of extra bagasse availability due to the expansion of the sugar plant, VPPL has decided to install high pressure co-generation system to meet captive power demands and to export excess power to the Southern Regional grid. In India the operation of low pressure co-generation plant to meet captive power demand, is considered common practice. VPPL decision to implement a high pressure co-generation system is considered because of the opportunity to improve the operational margins of the company, by the sale of power to the regional grid. Also considered by VPPL is the opportunity to provide environmentally friendly energy to the Southern Grid, which will assist in the local development of the region. Considering all of the above, VPPL decision in the implementation of high pressure co-generation system, is depended on additional revenue available through the CDM platform, to mitigate the associated barriers discussed further in the PDD. In the absence of project activity, VPPL would use existing power generation capacity to generate power for captive consumption, and also purchase power from the grid, to meet power demand for expansion of sugar plant. As a result there would be no export to the grid, and no displacement of power in the grid, which is comprised manly of fossil fuels.

The implementation of co-generation scheme demands consistency in performance and operation. The viability of bagasse based co-generation depends heavily on the availability of bagasse, as this is the fuel used for heat and power production. Any negative variance in the bagasse availability will be a constraint on the operation of the co-generation plant. Hence the improvement of the technical performance, while maintaining the crushing rate at lowest demand for steam and power is necessary. The turbine generator will be powered by the combustion of bagasse, a by-product of the sugar production process, and will therefore be a renewable carbon neutral source of electricity.

The expansion of co-generation plant will be implemented in two phases and will have an installed capacity of 20.5 MW after commissioning of both phases. The first phase consist of modernization of fiberizer, milling, boiling house and centrifugal station and a capacity up-grade to 4500 TCD crushing capacity. Phase I will also include the installation of a double extraction cum condensing T.G. set of 12.5 MW with cooling tower. The boiler configuration will include the existing two low pressure boilers of 21 kg/cm^2 at 52 TPH and 28 TPH, which will be used in conjunction with the high pressure boiler of 64 kg/cm^2 at 70 TPH. Phase II will include the capacity up-grade from 4500 TCD to 5000 TCD, with the additions of few types of equipment at milling and boiling house. Phase II will also include the installation of a new high pressure multi fuel boiler of 64 kg/cm^2 at 70 TPH which will replace the existing low pressure boiler of 21 kg/cm^2 at 52 THP and 28 TPH. In this case the final steam generation capacity is 140 TPH.

Given that steam and electric power generation for internal consumption and export to grid, is part of the present and proposed project activity, at VPPL sugar plant, emission reductions are only claimed for incremental power generation addition. Details of generation from project activity are given below.

Season Operation:

Particulars	No. of Days/hours	Installed Capacity	Power Generated (MW)	Captive Power (MW)	Export Power (MW)	Crushing Capacity (TCD)
Current	139/24	13.4	7.8	5.08	2.72	3500
Phase I	160/24	15.5	14.97	6.08	8.89	4500
Phase II	160/24	20.5	16.98	7.36	9.62	5000

Off-Season Operation:

Particulars	No. of Days/hours	Power Generated (MW)	Captive Power (MW)	Surplus Power (MW)
Current	0	0	0	0
Phase I	34/24	11	1	10
Phase II	150/24	11	1	10

Currently there is no off-season production of power, as most of production is related to captive use not export. The project activity will contribute to extra bagasse being saved during season production because of improved efficiency, and as a result will produce power mainly for export to the regional gird during the off-season of sugar crushing.

Contribution to Sustainable Development

The proposed project activity contributes to the environmental well being of the nearby areas, by reducing the GHG emissions through displacement of fossil fuel dominated grid electricity generation with a renewable electricity source and also it contributes substantially to the socio-economic well being of the nearby local communities. The VPPL project activity participants believe that biomass residue based power generation constitute a sustainable source of power generation that brings clear advantage to mitigate global warming. The sugar mill has been involved in the social and economic development of the area. The project's contribution to sustainable development is assessed on following criteria:

- Contribution to socio-economic well being
- Contribution to environmental well being
- Contribution to technology well being

Socio-economic well-being

- Enabling regional grid to divert the electricity displaced by the project activity to the nearby needy areas creating more opportunities for income generation projects and avoiding the load shedding and load low frequency of power.
- Indirect capacity building by providing a case example to other sugar mills in the region for switching to a high capacity cogeneration configuration, for exporting electricity to grid.
- The proposed project will help to build required infrastructure like roads within the region.
- The proposed project will also help VPPL to achieve financial stability and thereby allowing it to focus more on the up-liftment of the region and to promote efforts in improving cane production by providing support to farmers in areas of irrigation and better crop cultivation.

Environmental well-being

- The proposed project consumes surplus biomass residues and thus reduces fossil fuels.
- Long term measurable emission reductions are achieved by the proposed project as it utilizes biomass instead of purchasing power from the grid, which comprise manly of fossil fuels, helping to reduce GHG emissions and environment free from negative impact otherwise.

- The proposed project will utilize local resources thus creating healthy awareness and impact over all community growth with environmental benefits.

Technology well-being

- The successful operation of the project activity would thus encourage other entrepreneurs to install similar projects nearby.
- The project activity would help in grid stability in the surrounding remote areas and also reduce transmission and distribution (T & D) losses.

A.3. Project participants:

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)
Ministry of Environment & Forests (MoEF), Government of India	M/S Venkateshwara Power Project Ltd. (VPPL)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

Venkateshwara Power Project Ltd. (VPPL):

The Sugar Factory is located at Bedkihal, Taluka – Chikodi, District – Belgaum, State – Karnataka, India. The factory is located at 50 KM away from Kolhapur. The area of operation and cane cultivation is mostly irrigated by lifts, wells, and small canals. Doodhganga, Vedganga & Krishna Rivers are passing very near to sugar factory at a distance about 4 KM, 10 KM, 23 KM respectively.

A.4.1.1. Host Party(ies):

India

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

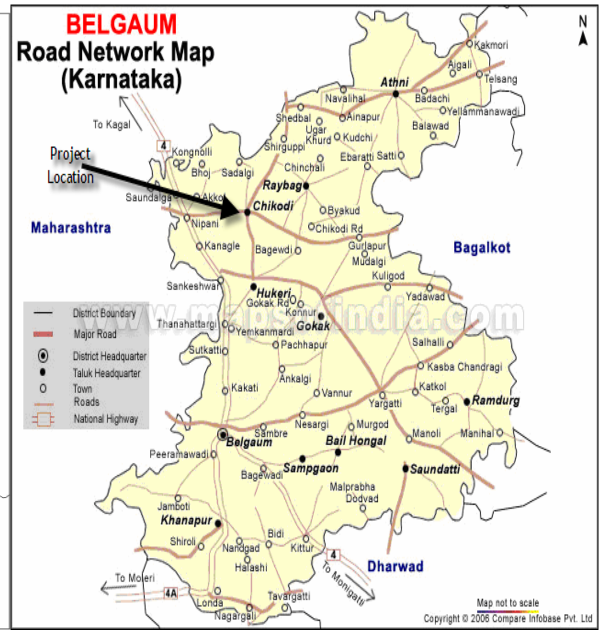
State: Karnataka

A.4.1.3. City/Town/Community etc:

District: Belgaum

Tal. Chikodi

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



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

The project activity is a bagasse based grid connected co-generation power project, which is primarily a renewable energy project. Therefore the project activity is to be categorized under

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

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

The proposed project activity is a grid-connected bagasse based cogeneration power plant with a high-pressure boiler and steam-turbine configuration. Sugar industries primary objective, has been to produce steam required for processing, and thus generating electricity for captive use using excess steam available. Since the process steam was required at low pressures, low pressure boiler could suffice the need of power and steam. In other words bagasse based co-generation for steam and power is not new to the sugar industry and is considered common practice for sugar plants.

Given that steam and electric power generation for internal consumption is part of the present and proposed project activity at VPPL sugar plant, emission reductions are only claimed for incremental power generation addition.

The project activity will be implemented in two phases. The implementation of Phase I will commence during the off-season of year 2007, which will include the modernization of sugar plant, which will commence in March 2007 and will be commissioned in October 2007. The 12.5 MW turbine will start construction in the off-season of 2008 which is March 2008 and will be commissioned in October 2008 which is the beginning of the crushing season for 2008-2009.

The details of Phase I have been given below:

During Phase I of project activity, VPPL will commission a new 12.5 MW double extraction cum condensing type turbine. The installation of double extraction cum condensing type turbine will allow for increased efficiency of electricity generation. The existing high pressure boiler (64.5 kg/cm^2) will be used to provide steam to the newly installed turbine. The 12.5 MW turbine will be used along side the existing back pressure turbines, contributing to a capacity of 15.5 MW. Since only one high pressure boiler will be in operation during Phase I, steam pressure is not adequate to operate the existing 8 MW back pressure turbine. As a result the turbine will be de-commissioned during Phase I and will be commissioned again during Phase II because of the installation of a new high pressure boiler (64.5 kg/cm^2) during Phase II.

Details of new condensing cum extraction type T.G 12.5 MW turbine are given below:

Condensing cum Extraction type T.G. set. - New T.G. set of CEST type		
a)	Capacity	12.5 MW @ 11KV voltage
b)	Type	Double extraction cum condensing type
c)	Inlet pressure & temp.	65 Ata/510 ^{o}C ± 5^{o}C
	Uncontrolled extraction at	8 Ata/290 ^{o}C
	Controlled extraction at	2.0 Ata/140 ^{o}C
	Condensing route at	0.1 Ata/46 ^{o}C
d)	Turbine shall have solid forged & machined rotor with integral discs.	
e)	Glands preferably of labyrinth type & sealed with steam.	
f)	Gland steam condenser 2 x 100% capacity.	
g)	Pressure lubrication & control oil system to be provided.	
h)	The oil system shall have. • Centrifugal type separator / purifier. • A.C. motor driven pump. D.C. motor driven pump, main oil pump emergency gravity lube oil system with S.S. piping • 100% water cooled oil cooler • 100% oil filter • Oil storage & setting tank, reservoir, duplicate strainer, level indicator, float switches, alarm, contacts, oil mist eliminator • Flow and temp indicator.	
i)	The turbine governors of electronic type suitable for state electricity grid connection and operation, speed control, over speed control, load control, steam pressure control.	
j)	The generator characteristics shall be suitable to run it in parallel to state power grid.	

k)	Vibration measuring and monitoring system to be provided.
l)	The condenser of non-contact surface type designed as per AME Section. VII Div. & suitable for inlet water temp. of 32 °C and out let temp. of 42 °C. (for condensing cum extraction type Turbine un Stage – II)
m)	Three number condensate extraction pumps of vertical design type shall be provided.
n)	Reduction gearbox between turbine and generator shall be of double helical type, having 1.7 service factor.
o)	Barring gear mechanism with A.C. driven motor to prevent thermal distortion shall be provided.
p)	Turbine control shall be through the centrally located DCS.
q)	The control system shall include : - Speed - Load - Emergency and control valve lift. - Control fluid pressure - Thrust pad metal temp. - Axial position of thrust collar relative to its own housing. - Differential expansion between shaft and casing. - Axial Expansion of casing from anchor point. - Shaft eccentricity. - Bearing vibrations - Steam and metal temp. - Contact for annunciation and alarm as required.

<u>The details of Phase II are given below:</u>

Phase II of project activity will include the installation of a new high pressure boiler, which will commence in the off-season of 2009, which is March of 2009, and will be commissioned during October 2010 which is the start of the crushing season of 2010-2011. The details of Phase II are as follows:

Phase II will consist of the installation of a travelling gate/multi fuel high pressure boiler (64.5 kg/cm^2) with a capacity of 70 TPH. This boiler will be used along side the existing high pressure boiler and be able to provide a total steam capacity of 140 TPH. This steam capacity will be adequate to provide steam to the new installed 12MW double extraction cum condensing type turbine (installed during phase 1) and the existing 8MW back pressure turbine, which was de-commissioned during Phase I because of in-adequate steam pressure. The installed capacity after Phase II will be 20.5 MW.

The details of the new boiler to be installed are given below:

Boiler :		
a)	Capacity	- 70 TPH, 64.5 Ata, 510°C ± 5°C
b)	Type	- Spreader stroker, Traveling grate/Multi-fuel.
c)	Feed water temp.	- 105 °C
d)	Excess Air	- 35%
e)	Boiler flue gas outlet temp.	- 150 °C
f)	Super heater shall have control of steam temperature.	
g)	Economizer and Air heater as heat recovery units.	
h)	Scoot Blowers for; - Super-heater - Economizer - Boiler Tubes	
i)	Blow down heat recovery system	
j)	De-aerator of capacity suitable 140 TPH boiler	
p)	Boiler feed pumps - 3 x 80 m^3/Hr capacity	
q)	Boiler refractory, insulation, outer casing, ducting, piping valves, fittings etc.	
r)	Electrical MCC with starter/VFD, motors, cables, controls, trays, panels	
s)	Boiler instrumentation & control based on DCS system	
v)	All H.P. piping, valves, main steam distribution header etc.	

The implementation of co. generation scheme demands consistency in performance & operation. The viability of bagasse based co-generation depends heavily on the availability of bagasse. Hence the main aim while increasing co-generation capacity is target to have minimum steam consumption of about 46% by using recent techniques & machineries. Similarly to reduce the electrical power consumption the avenues like milling plant, centrifugal section considering & cooling systems are identified & the recommendations are given below. This modernization of sugar plant will commence in March of 2007 and will be implemented in October of 2007. The crushing capacity will be increased to 4500 TCD in Phase I and then will increase to 5000 TCD in Phase II of project activity. The increase in crushing capacity is due the increase in availability of the sugarcane in the region and also in alignment with the overall growth plans of VPPL.

Addition of Modern Equipments for saving steam & Electrical power:

1. The modernization at juice heating station, evaporator station and vacuum pan floor shall effect in reduction in the steam consumption.
2. Reduction in power consumption and improvement in capacity utilization will be achieved by adoption of following techniques.
    - Auto cane feed control system: For uniform cane flow.
    - Auto water imbibitions systems
    - Juice mass flow meter
    - Planetary gear boxes: for crystallizers, magma mixer etc.
    - Single entry condensers to reduce the cooling water requirement and hence to reduce the power consumption at condensing and cooling station
    - Auto power factor control unit for reducing the electrical current loading on Turbo Alternator
    - Toothed Roller Pressure Feeder (TRPF)

- D.C. Drive motors for mills.
- Condensate cooling & reuse systems.

The source of bagasse for the co-gen plant is from the sugar manufacturing division of VPPL, meaning the co-generation plant and the sugar plant are located in the same plant, and are adjacent to each other. Therefore, the collection and transport system is minimal between the plants. The source of water to the plant is from Doodhganga river and has been sanctioned sufficient quantity of water, by the irrigation department as per their letter No. DS/001 S.I. No. 247776 M.Z. Division, Belgaum Dt. 21-12-2005.

The sugar factory can accommodate the switch yard for export of surplus power of 10 MW. Transmission line to 110 KV sub-station toward Sadalaga at 8.45 KM distance is already laid down & presently surplus power is exported to Karnataka grid through this transmission line. The power generated at 11 KV will be stepped up to 110 KV and exported to KPTCL grid at KPTCL sub-station - 110KV at Sadalga through transmission lines.

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

Years	**Annual estimation of emission reductions in tonnes of CO_2 e**
2008/2009	26,831
2009/2010	26,831
2010/2011	56,163
2011/2012	56,163
2012/2013	56,163
2013/2014	56,163
2014/2015	56,163
2015/2016	56,163
2016/2017	56,163
2017/2018	56,163
Total emission reductions (tonnes of CO_2 e)	**502,966**
Total number of crediting years	10 years
Annual average over the crediting period of estimated reduction (tonnes of CO_2 e)	50,296

A.4.5. Public funding of the project activity:

No public funds will be invested in the project activity.

The project activity is not a de-bundled component of a large project activity as there is no registered small scale project activity or application to register another project activity;

- With the same project participants
- In the same project category and technology
- Registered within the previous two years
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale 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 project activity:

Approved consolidated baseline and monitoring methodology ACM0006, Version 06, 10 August 2007 "Consolidated baseline methodology for grid-connected electricity generation from biomass residues" is applied to the project activity.

Additionality is determined by the use of "Tool for the demonstration and assessment of additionality", version 04.

"Consolidated baseline methodology for grid-connected electricity generation from renewable sources" ACM0002 version 06, 19 May 2006 is used to determine the baseline grid emission factor.

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

The above methodology is applicable to grid connected and biomass residue fired electricity generation project activities, including cogeneration.

As per the methodology, it may include:

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

The proposed project activity is the expansion of grid-connected bagasse based electricity generation capacity involving the installation of facilities for allowing the export of electricity to the regional grid. The project involves the installation of a new 12 MW backpressure type turbo generator during Phase I along with a high pressure 64.5 kg/cm^2 boiler of 70 TPH capacity during Phase II, which will operate next to the existing biomass residue power generation unit fired with the same biomass residue. The power generated by the new power unit will be utilized for the sugar unit's captive power consumption purposes and the surplus power will be exported to the grid. The project activity involves reductions in CO_2 emissions by displacing the electricity generation from the fossil fuel dominated grid with renewable electricity.

Further,

- **No other biomass types aside from biomass residues, as defined in consolidated baseline methodology ACM0006 will be used in the project plant.**

  The proposed project activity is the expansion of bagasse based electricity generation capacity. The existing and newly installed turbo-generators will be fired by bagasse, a by-product of the sugarcane processing and a biomass residue as defined in consolidated baseline methodology ACM0006.

- **The biomass residue to be used in the cogeneration plant will be supplied from the same facility, where the project is implemented.**

  The present bagasse generation capacity at the VPPL plant in Karnataka is sufficient enough to meet the fuel requirement of the new co-generation facility during the crushing season of the sugar plant. The season operating days of the new cogeneration unit are chosen on the basis of in-house bagasse generation capacity of the sugar mill. Hence, the project activity will use bagasse produced within the sugar unit only.

- **The implementation of project will not result in an increase of the cane processing capacity of the sugar factory.**

  The decision of expansion of co-generation plant, from the current 3,500 TCD to a range of 5000 TCD after Phase II, is purely to increase the sugar production. VPPL main business is the production of sugar and the fuel used to produce clean energy is the by-product of sugar. VPPL as part of this project activity will undergo implantation of energy efficiency to existing sugar production equipment to reduce steam and energy consumption, so as to improve the technical performance while maintaining the crushing rate at lowest demand.

- **The biomass residue at the project facility will not be stored for more than one year.**

  As mentioned earlier, the number of operating days of the new cogeneration unit is chosen on the basis of in-house bagasse generation capacity of the sugar mill. Hence, the project activity is designed to use all the bagasse generated in the sugar mill. Hence, the residue will not be stored at the project facility for more than one year.

- **No significant energy quantities are required to prepare the biomass residues for fuel combustion.**

  Bagasse is burnt in boilers as generated from the sugar mill and does not require any specific technology for its preparation before combustion. No fuel preparation equipment has been installed at site for preparation of bagasse. Hence no significant energy quantities are required to prepare the biomass residues for fuel combustion.

Thus the project activity covers all the applicability conditions for the methodology.

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

Under the proposed methodology the project boundary is drawn around the point of fuel supply to the electricity system (grid system) that the CDM project power plant is connected to.

The Indian power grid system is split into five regions. The regional grids facilitate the transfer of electricity between states, which is supplied by state-owned and central sector power generating stations. Karnataka state falls within the Southern Region, hence grid based plants supplying electricity to the Southern Grid are chosen as the sample for the analysis of the grid emission coefficient.
For the purpose of determining the baseline emissions only CO2 emissions from fossil fuel fired power plants connected to the electricity system are included.

No GHG emissions from the project activity are included in the project boundary.

The project activity also does not include any GHG emissions related to the decomposition or burning of biomass nor does it claim for emission reductions from heat. The baseline heat emissions for the proposed project activity are not included in the project boundary as permitted in the consolidated methodology ACM0006 Version 06, 10 August 2007.

The table below summarizes the gases included in the project boundary for the purpose of calculating project emissions and baseline emissions.

	Source	Gas	Included	Justification / Explanation
Baseline	Grid electricity generation	CO2	Yes	Main emission source
		CH4	No	Excluded for simplification. This is conservative
		N2O	No	Excluded for simplification. This is conservative
	Heat generation	CO2	No	The heat requirement will be met through combustion of same type biomass residue as before the project activity and it is demonstrated that the heat generated per unit of biomass in the project activity is greater than or equal to the heat generated per unit of biomass in the baseline scenario.
		CH4	No	Excluded for simplification. This is conservative.
		N2O	No	Excluded for simplification. This is conservative.
	Uncontrolled burning or decay of surplus biomass residues	CO2	No	As per ACM0006 version 6
		CH4	No	Not applicable under the selected baseline scenario
		N2O	No	Excluded for simplification. This is conservative.
Project Activity	On-site fossil fuel and electricity consumption	CO2	No	No fossil fuel/electricity will be consumed at the project site due to the project activity
		CH4	No	No fossil fuel/electricity will be consumed at the project site due to the project activity

	due to the project activity (stationary or mobile)	N2O	No	No fossil fuel/electricity will be consumed at the project site due to the project activity
	Off-site transportation of biomass residues	CO2	No	No biomass residue from of-site will be used for the project activity
		CH4	No	No biomass residue from of-site will be used for the project activity
		N2O	No	No biomass residue from of-site will be used for the project activity
	Combustion of biomass residues for electricity and / or heat generation	CO2	No	As per ACM0006 version 6
		CH4	No	Not included in the baseline scenario
		N2O	No	Excluded for simplification. This emission source is assumed to be small.
	Storage of biomass residues	CO2	No	As per ACM0006 version 6
		CH4	Excluded	As per ACM0006 version 6.
		N2O	Excluded	As per ACM0006 version 6

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

The identification of the baseline scenario is made through the analysis of the following alternatives:

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

Given below is the assessment for different alternatives and baseline option for the project activity.

Power:
The present captive steam and power requirement of the VPPL plant is supplied through three boilers and four turbines. The boilers configuration at VPPL plant comprises of one 65 kg/cm^2 pressure boiler of 70 TPH capacity, and two 21 kg/cm^2 pressure boilers of 52 TPH and 21 TPH capacity. The present power generation set up consists of one backpressure type turbo generators of 8 MW, and three backpressure type turbo generators of 1.8 MW for an installed capacity of 13.4 MW. As project activity is only electricity generation expansion capacity project, in the absence of the project activity the sugar mill would have continued with the present set up. Hence, the baseline scenario is continuation of the present operations and the power alternative **P4 "***The generation of power in existing and/or new grid-connected power plants***"** is applicable to the project activity.

Biomass:

At present all biomass residues generated in the sugar mill is used for meeting the captive heat and power demand of the sugar mill. In the absence of the project activity, the sugar mill would have continued with same process, the combustion of the bagasse generated in the unit to generate steam and power to meet the internal captive demand. Hence alternative **B4** *"The biomass residue is used for heat and/or electricity generation at the project site"* is the applicable baseline scenario in the project case.

Heat:

At present, the heat requirement of the unit is fulfilled through firing of bagasse in the existing boilers. In the absence of the project activity the process would have continued. Hence, alternative **H4** *"The generation of heat in boilers using the same type of biomass residue/residues"* is chosen as the baseline scenario for the project activity.

On the basis of the analysis above, it can be seen that alternatives **P4**, **B4** and **H4** are the baseline scenarios for the project activity. This specific combination of alternatives is defined under **baseline scenario 12** as per ACM0006 Version 06, which states that:

"The project activity involves the installation of a new biomass residue fired cogeneration unit, which is operated next to (an) existing biomass residue fired power generation unit(s). The existing unit(s) are only fired with biomass residue and continue to operate after the installation of the new power unit. The power generated by the new power unit is fed into the grid or would in the absence of the project activity be purchased from the grid. The biomass residue would in the absence of the project activity be used for heat generation in boilers at the project site. This may apply, for example, where the residues have been used for heat generation in boilers at the project site prior to the project implementation."

Given that steam and electric power generation for internal consumption is part of the present and proposed project activity, emission reductions are only claimed for incremental power generation for captive use and power generation injected to the regional grid. In the absence of project activity, VPPL would continue to operate low pressure co-generation system to meet captive power demand. Therefore, the baseline scenario is the emission of GHG from the present electricity generation mix of the Southern Grid.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality): >>

The VPPL project activity is a project comprising "Grid connected electricity generation from biomass residues". It's a renewable energy based power generation project with net zero CO_2 emissions (due to carbon sequestration by the sugarcane plants) and exports power to the Karnataka state grid. The power generated from the project activity would displace electricity that would otherwise have been generated by the grid-connected power plants in the Southern Grid.

As per the decision 17/cp.7 para 43, a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.

As described in the methodology, the most plausible baseline scenario will be identified among all the realistic and credible alternatives by using the "Tool for the demonstration and assessment of additionality" version 4.

Step 1: **Identification of alternatives to the project activity consistent with current laws and regulations**		**Pass:** **Move on to Step 2**
Sub-step 1a: Define alternatives to the project activity	The following alternatives were identified by the project proponent. Given that steam and electric power generation for internal consumption, is part of the present and proposed project activity, at VPPL sugar plant, emission reductions are only claimed for incremental power generation addition. Therefore, the project options presented below only correspond to alternative scenarios for surplus electric power generation. The present setup at VPPL sugar unit is sufficient to meet the captive steam and power requirement of the sugar mill, leading to no electricity exports to the grid. The proposed project activity is the power plant capacity expansion project involving installation of new high pressure (64 kg /cm2) boiler, along with a 12 MW turbine, which will be operating next to existing biomass power generation unit and will be fired with the same biomass residue. The alternatives scenarios available to VPPL for surplus electric power generation are as follows: • Continuation of the current power generation setup at the sugar plant • The proposed project activity not undertaken as a CDM project activity In the absence of the project activity VPPL management would have decided to continue with the present system and generate electricity to meet the sugar plants captive demand with no export to grid. As this alternative is common practice in the region, and will be discussed further in step 4 of the additionality tool *Sub-step 1b. Enforcement of applicable laws and regulations* There are no national policies relevant to the baseline and the sugar factories in India are not required to install high pressure boilers for grid based electricity generation. The options presented above are plausible, credible and realistic. The operation of bagasse based power plants for captive steam and electricity generation is common amongst the sugar industry, It is therefore fair to say that these options are consistent with the applicable laws and regulations as demonstrated by existing practices. There is no policy in India that mandates the generation of electricity for grid supply from bagasse. The policy frameworks for	

<table>
<tr><td></td><td colspan="2">bagasse based grid electricity supply are governed by the state electricity regulatory commissions which detail the terms of power purchase agreements for such investments.</td></tr>
<tr><td colspan="2"><u>Step 2:</u>
Investment analysis:
Determine where the proposed project activity is economically or financially less attractive than at least one other alternative, identified in step 1, without the revenue from the sale of certified emission reduction (CERs)</td><td>Move on to Step 3</td></tr>
<tr><td colspan="3">Barrier analysis will be conducted to prove additionality of this project activity</td></tr>
<tr><td colspan="2"><u>Step 3:</u>
Barrier analysis</td><td><u>Pass:</u>
Move on to Step 4</td></tr>
<tr><td><u>Sub-step 3a:</u> Identify barriers that would prevent the implementation of the proposed CDM project activity</td><td colspan="2">Do to the expansion of the sugar plant, the availability of bagasse will increase and also an increase of power to meet captive demand of sugar process is required. Currently VPPL has co-generation plant that meets captive power demand and also export's around 2-3 MW per year. In the absence of project activity, VPPL current co-generation configuration will be sufficient to meet the increase in captive power demand due to the expansion of the sugar plant, by eliminating export to grid and purchasing minimal electricity from the state grid, which is comprised mainly of fossil fuel power plants.

As a result the set-up of another high pressure system was considered only because of the opportunity to improving operational margins of the sugar plant, by increased revenue due to sale of power to the regional grid, and VPPL opportunity to contribute to the sustainable power generation for the region. The reasons clean renewable power production in the sugar industry for power export, is not adopted as common practice in the region is due to the high capital investment needed[1] and the various barrier these types of projects face. Also it is envisioned that the overall financial situation of VPPL after the implementation of project activity should improve due to the increased revenue from export of power to the regional grid and should help in the long term success of the company. Even after considering the benefits there are barriers faced by the project activity which impacts the overall success of the project and are described below:

<u>Bagasse Availability</u>

The revenues of the project are dependent on the quantity of power exported to KPTCL. As a result the power exported is directly depended on the cane availability since bagasse is used as fuel. There are often chances of diversion of cane by farmers to other sugar mills in the nearby areas. The growth of sugar mills in Karnataka, has lead to competition among the sugar mills for the natural resource</td></tr>
</table>

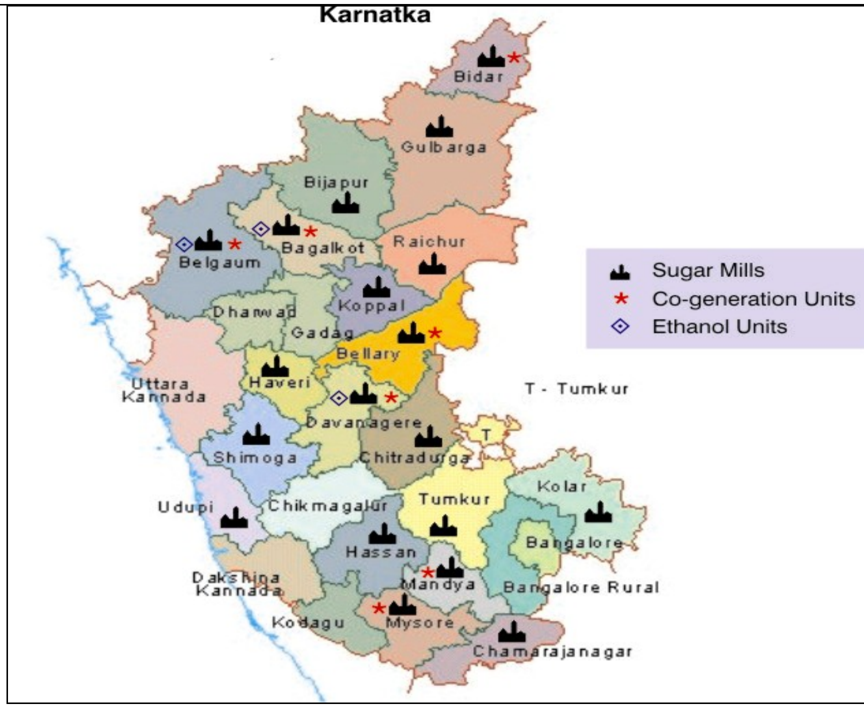
[1] Commission for agricultural costs and prices report on price policy for sugarcane for the 2004-05 season (point No.25), see http://dacnet.nic.in/cacp/sugar-final.htm

	utilisation i.e. agriculture farm produce, and leading to the farmers option for getting varying prices among the sugar mills in the region[2]. This diversion is also an important constraint faced by the project promoters and can significantly influence the cane crushing capacity and in turn the power generation capacity of the sugar mill. In addition to this there is often diversion of cane from sugar mill to khandsaris and ghur manufactures. These manufacturers offer higher prices as they operate in unorganised sector and have no quality assurance plans. These diversions put a constraint on cane availability and hence bagasse which again may impact the viability of the project activity Along with that, the uncertainty in weather conditions plays an important role in determining the cane availability in the region. There is a continuous weather related risk for cane under rain fed cultivation conditions. This can affect the technical performance of the plant due to poor cane availability and disease affect cane. The implementation of this project activity as a CER project, will help mitigate this barrier, and will play a key role for the long term success of this project activity. **Institutional Barrier** The main purpose of the project is to generate revenue from the sale of surplus power to KPTCL (Karnataka Power Transmission Corporation Ltd), to improve operational margins of the sugar plant. The project depends on the payment from KPTCL against the sale of electricity to the grid, this is the only source of revenue to mitigate the high capital investment needed for this project activity, and therefore the economic feasibility of this project is vulnerable to KPTCL power purchase tariff and related policies. The power purchase agreement (PPA) between VPPL and KPTCL is structured is such a way that the quantity of energy delivered and the tariff payable are liable to revision. This posed a significant risk to the long term cash flow and feasibility of the project activity. Any downward revision of the PPA tariff structure will have a serious negative impact on the project activity. VPPL has decided to take these risks because of the opportunities of additional carbon revenue. **Technological Barrier** The most possible alternative to the project activity is to continue with the existing co-generation facility. The project activity involves the implementation of a high pressure co-generation system therefore certain performance uncertainties had to be considered before implementing the project activity, relating to high pressure co-generation systems. The design, construction and operation of a high pressure co-generation system are

[2] http://agricoop.nic.in/farmprices/MSP.pdf

<table>
<tr><td></td><td colspan="2">significant different from that of a low pressure system. At high operating pressure, the boilers ability to withstand thermal and mechanical stress, along with water chemistry assumes critical importance. The sustained performance and operational life of a co-generation power depends on various factors like thermal stress patterns, quality of water, steam parameters, cooling water parameters and proper operating and maintenance. A high pressure system is more sensitive to these factors then a low pressure system, thus increasing the risk of performance loss and equipment damage. Any performance loss or frequent maintenance shutdowns would also reduce the power and steam output. As a result such a situation would not only affect the energy sale revenue, but also affect the primary manufacturing process of sugar.

Thus VPPL had to factor this into consideration before implementation of project activity. Since VPPL conception of project activity, was only the opportunity to improve operating margins, the technological risk associated with a high pressure system had to be mitigated by some other means. The CDM revenue which would be available once the project is registered as a CDM project activity will help mitigate this barrier.</td></tr>
<tr><td><u>Sub-Step 3b:</u> Show that the identified barrier would not prevent the implementation of at least one of the alternatives</td><td colspan="2"><u>Institutional Barrier</u>
As described in section 3a, the institutional barrier will not affect the alternative of continuing the operation of present power generation setup at the sugar unit. As the primary focus of current situation is power generation to be able to meet captive power demand, not export to grid.</td></tr>
<tr><td colspan="2"><u>Step 4:</u>
Common practice analysis</td><td><u>Pass:</u>
Move on to Step 5</td></tr>
<tr><td><u>Sub step 4a:</u> Analyze other activities similar to the proposed project activity</td><td colspan="2">In India, all the sugar mills have their own cogeneration units, most of them operating with low-pressure boiler configuration of below 45 kg/cm2 (Maximum are in the range of 21 kg/cm2 to 45 kg/cm2) to cater to the in house steam and power requirements. This scenario (present situation of sugar mills) is considered as “Business As Usual” case for the Indian sugar industry, where in, bagasse is used at lower efficiency levels to meet the internal power requirements of sugar mills. Conventionally it is easier for sugar mills to opt for low efficiency cogeneration plant considering that they are less capital intensive. Cogeneration plants with outlet boiler pressure of 45-kg/cm2 produce lesser power and are less capital intensive.</td></tr>
</table>



Sugar Plant Map of Karnataka[3]

Similar sugar plant in the state of Karnataka[4]

Total number of Sugar Mills in Karnataka (as on Dec 2006)	*40*
Sugar Mills with co-generation and export of power to grid	*15*
Sugar Mills Under CDM Framework	*9*

The common practice scenario as tabulated in the above table substantiates that the project activity without CDM benefits is not a preferred proposition for the sugar manufacturing units in similar socio-economic environment of Karnataka State. As there are a total of 40 mills commissioned in Karnataka only 15 plants are exporting electricity to regional grid and of these 9 projects are conceptualised under the Clean Development Mechanism.

The old boiler and turbine configuration (which meets the plant's energy requirements) is the most common practice adopted by the sugar manufacturing

[3] http://www.indiansugar.com/sugarmap/index.htm

[4] http://www.kerc.org/english.html (then go to Annual Report and select ANNUAL REPORT FOR FY06 report and then select second (Annexure - 3.6 -CONTD))
http://www.karnataka.com/industry/sugar/
http://www.karnataka.com/industry/sugar/co-operative-factories.html
http://www.karnataka.com/industry/sugar/notworking.html

http://www.cdmpipeline.org/ (CDM Pipeline (1st October - 2006)) units across the country. The Indian sugar manufacturers have been utilising their bagasse in an inefficient manner by using low-pressure boilers (with low electrical and thermal energy efficiency) to generate steam and electricity only for in-house consumption. In similar project sector, socio-economic environment, geographic conditions and technological circumstances, the project activity uses an efficient technology, which is not a common practice.

Further as per reports conducted on "Promotion of Biomass Cogeneration with Power Export in the Indian Sugar Industry[5]", most of the sugar industries operating in the region continue to use low or medium pressure boilers for co-generation purpose. Prior to the mid-1970's, the steam pressure used in the majority of boilers located in Indian sugar mills was in the range of 10-15 kg/cm^2, which subsequently increased to the prevailing average of 21 kg/cm^2. The majority of the boiler systems in Indian sugar mills operate at a pressure of 21 kg/cm^2 and temperature of 340^{o}C, although some mills employ 14 kg/cm^2/265 ^{o}C or 32 kg/cm^2/38 ^{o}C steam systems. In the mid-1980, a few Indian mills installed medium pressure (42 kg/cm^2) boilers.

The summary of the current scenario and the proposed co-generation scenarios is outlined below

Parameter	Current	USAID Study Norms	RFP Requirements	Proposed
Capacity, TPD	2500-6000	2500-6000	2500	2500-7000
Pressure, ata	14-21	63	60	62-87
Temperature, C o	320-340	480	430	480-510
Operation, day/yr	180-210	300	270	270-310
Steam Consumption, % on cane	50	40	NS	NA
Power Generation, MWe	3-8	15-50	NS	15-50
Capital Investment $/kW	0	714	NS	371-886

Table 7. "Promotion of Biomass Cogeneration with Power Export in the Indian Sugar Industry" Copy of the report will be given to the DOE for their review. *http://www.netl.doe.gov/publications/carbon_seq/articles/india.pdf*

Based on the above steps, it may be satisfactorily concluded that the VPPL project activity is not a baseline scenario and hence is clearly additional. The likely non-project scenario would be the continuation of current set up.

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

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Scenario 12, from ACM0006 Version 06, 10 August 2007, is the identified baseline scenario for the proposed project activity. The justification of its applicability has already been demonstrated in section B.4.

The following equation is used to calculate the net emissions reductions from the project activity:

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

Where:

ER_y	Are the emission reductions of the project activity during the year y in tons of CO_2
$ER_{heat,y}$	Are the emission reductions due to displacement of heat during the year y in tons of CO_2
$ER_{electricity,y}$	Are the emission reductions due to the displacement of electricity during the year y in tons of CO_2
$BE_{biomass,y}$	Are the baseline emissions due to natural decay or burning of anthropogenic sources of biomass during the year y in tons of CO_2
PE_y	Are the project emissions during the year y in tons of CO_2 and
L_y	Are the leakage emissions during the year y in tons of CO_2

A. Project Emissions

Project emissions include CO_2 emissions from transportation of biomass residues to the project site (PET_y), CO_2 emissions from on-site consumption of fossil fuels due to the project activity ($PEFF_y$), CO_2 emissions from consumption of electricity ($PEEC_y$) and where this emission source is included in the project boundary and relevant CH_4 emissions from the combustion of biomass residues ($PE_{Biomass\ CH4,y}$).

$$PE_y = PET_y + PEFF_y + PEEC_y + GWP_{CH4} * PE_{Biomass\ CH4,y}$$

Where:

PET_y	CO_2 emissions during the year *y* due to transport of the biomass residues to the project plant (tCO_2/yr)
$PEFF_y$	CO_2 emissions during the year *y* due to fossil fuels co-fired by the generation facility or other fossil fuel consumption at the project site that is attributable to the project activity (tCO_2/yr)

$PEEC_y$ — CO_2 emissions during the year *y* due to electricity consumption at the project site that is attributable to the project activity (tCO_2/yr)

GWP_{CH4} — Global Warming Potential for methane valid for the relevant commitment period

$PE_{Biomass\ CH4,\ y}$ — CH4 emissions from the combustion of biomass residues during the year *y* (tCH4/yr)

The proposed project activity doesn't include the CO_2 emissions from off-site transportation of biomass, from fossil fuel co-firing and from electricity consumption at site. The project activity also doesn't include the CH_4 emissions from the combustion of biomass. Hence

PET_y = 0
$PEFF_y$ = 0
$PEEC_y$ = 0
$PE_{Biomass\ CH4,\ y}$ = 0

Therefore, PE_y = 0

Emission due to combustion of fossil fuel in the project activity					
No	Notation	Parameter	Unit	Value	Comments
1.	$FF_{project\ plant\ .y}$	Quantity of coal used	T/year	0	Will be measured if used. Will only be used during emergency, and shortage of bagasse
2	NCV	Calorific Value	TJ/T coal	0	Will be measured if used.
3	EF_{CO2}	CO2 emission Factor	tCO_2/TJ	96.1	IPCC default value
4	OXID	Oxidation Factor		0.98	IPCC default value
5.	COEF (2*3*4)	CO2 emission factor	tCO_2/TJ	0	Methodology Formula
6.	$PEFF_y$ (1*5)	CO2 emission form coal	tCO_2/year	0	Methodology Formula

B. <u>Baseline Emissions</u>

$ER_{heat,\ y}$, $ER_{electricity,\ y}$ and $BE_{biomass,\ y}$ constitute the baseline emissions of the project activity.

1. <u>Emission reductions due to displacement of heat</u>

   The baseline heat emissions for the proposed project activity are not included in the project boundary. Under baseline scenario 12 the heat emissions for the project activity are assumed to be zero. As per the ACM0006 version 06 10 August 2007, it is demonstrated that the heat generated per unit of biomass residue in the project activity is greater than or equal to the heat generated per unit of biomass residue in the baseline scenario. Please refer to CER calculation sheet, for further details.

   Hence, $ER_{heat,\ y}$ = 0

2. Emission reductions due to displacement of electricity

The baseline emissions due to displacement of electricity are determined by the following equation,

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

Where:

EG_y is the net quantity of electricity generation as a result of the project activity (incremental to baseline generation) during the year y in MWh, and

$EF_{electricity,\,y}$ is the CO_2 emission factor for the electricity displaced due to the project activity during the year y in tons CO_2/MWh.

Determination of CO_2 emission factor

The calculation of EF_y is carried out through the application of relevant sections of methodology ACM0002 version 6. The sources of data for the combined margin EF_y are presented in the CEA CO2 baseline database and will be calculated ex-post from the average of the Simple Operating Margin (OM) and the Build Margin (BM). The application of the methodology does require the use of default values for the weightings applied to the Simple OM and BM and have applied the standard weightings of 50:50.

Grid system of the proposed project activity:

In India, electricity network is divided into regional grids such as northern, western, southern, eastern and north-eastern. The state of Karnataka is in Southern Region grid. The Southern Region grid consists of five states (Andhra Pradesh, Karnataka, Kerala, Lakshadweep, Pondicherry and Tamil Nadu). These states under the regional grid have their own power generating stations as well as centrally shared power-generating stations causing dynamic variance between states due to inter-state power transactions.

Considering free flow of electricity among the member states and the union territory through the Southern Region Load Dispatch Centre (SRLDC), the entire Southern grid is considered as a single entity for estimation of baseline.

Calculation of operating margin

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} . COEF_{i,j}}{\sum_{j} GEN_{j,y}}$$

Where:

$F_{i, j, y}$ is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y

j Refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid,

$COEF_{i, j}$ is the CO_2 emission coefficient of fuel i (t CO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y and

$GEN_{j, y}$ is the electricity (MWh) delivered to the grid by source j in year y.

The CO_2 emission coefficient $COEF_i$ is obtained as

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

Where:

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel i,
$OXID_i$ is the oxidation factor of the fuel (see page 1.29 in the 1996 Revised IPCC Guidelines for default values),
$EF_{CO2, i}$ is the CO2 emission factor per unit of energy of the fuel i.

Where available, local values of NCV_i and $EF_{CO2, i}$ should be used. If no such values are available, country-specific values (see e.g. IPCC Good Practice Guidance) are preferable to IPCC world-wide default values.

Calculation of build margin

$$EF_{electricity, y} = w_{OM} * EF_{OM, y} + w_{BM} * EF_{BM, y}$$

Where the weights w_{OM} and w_{BM}, as per ACM0002 version 06 19 May 2006, are 50%.

Considering data available for thermal power plants from annual reports by CEA, the combined margin emission factor and calculations are presented in the CEA (Central Electricity Authority): CO2 Baseline Database version 3

Description	Value	Source of information
EF_{OM} **CO2equ / MWh**	1.00	CEA Baseline Carbon Dioxide Emissions from Power Sector Version 3[6]
EF_{BM} **CO2equ / MWh**	0.71	
Weight age for Simple Operating margin	0.50	ACM0002 version 06 19 May 2006

[6] Please refer to CEA Carbon Dioxide Emission Database Version 3.0 http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

emission		
Weight age for Build margin emission factor	0.50	ACM0002 version 06 19 May 2006
Combined Margin emission factor t CO2/MWh	0.85	**ACM0002 formula Net Carbon Emission Factor of Southern Region Grid by combined margin is average of = EFOM + EFBM.** **EF = (EFOM + EFBM) / 2**

Determination of net quantity of electricity generation

Under baseline scenario 12: EG_y corresponds to the lower value between
(a) The net quantity of electricity generated in the new power unit that is installed as part of the project activity ($EG_{project\ plant,y}$) and
(b) The difference between the total net electricity generation from firing the same type(s) of biomass residue at the project site ($EG_{total,y}$) and the historical generation of the existing power unit(s) ($EG_{historic,3yr}$), based on the three most recent years, as follows

$$EG_y = MIN\left\{ \begin{array}{l} EG_{projectplant,y} \\ EG_{total,y} - \frac{EG_{historic,3yr}}{3} \end{array} \right\}$$

Where:

EG_y is the net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y in MWh, is the net quantity of electricity generated in the project plant during the year y in MWh,

$EG_{total,\ y}$ is the net quantity of electricity generated in all power units at the project site, generated from firing the same type(s) of biomass residue as in the project plant, including the new power unit installed as part of the project activity and any previously existing units, during the year y in MWh,

$EG_{project\ plant,\ y}$ is the net quantity of electricity generated in the project plant during the year y in MWh,

$EG_{historic, 3yr}$ is the net quantity of electricity generated during the most recent three years in all power plants at the project site, generated from firing the same type(s) of biomass residue as used in the project plant, in MWh.

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

Under baseline scenario 12, $BE_{Biomass,y}$ = 0. Also, the project participants propose to exclude the CH_4 emissions (both baseline emissions and project emissions) from the project boundary, as permitted in the consolidated methodology ACM0006 Version 06 10, August 2007.

C. <u>Leakage Emissions:</u>

Under baseline scenario 12 the diversion of biomass residue to the project activity is already considered in the calculation of the baseline reductions in ACM0006 Version 06 and hence as per methodology leakage issues need not be addressed.

$L_y = 0$,

D. <u>Emission reductions</u>

The emission reductions equation converges to,

$ER_y = ER_{electricity, y}$

Since,
$PE_y = 0$, $ER_{heat,y} = 0$, $BE_{biomass,y} = 0$ and $L_y = 0$.

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

Data / Parameter:	*EF electricity, y*
Data unit:	*tCO2e/ MWh*
Description:	*Grid Emission Factor – SR Grid*
Source of data used:	*"CO2 Baseline Database for the Indian Power Sector" – Central Electricity Authority (CEA); Ministry of Power*
Value applied:	*0.85*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Grid emission factor has been estimated by Central Electricity Authority (CEA) and is based on methodology guidelines as explained in ACM0002.*
Any comment:	*CEA Baseline Carbon Dioxide Emissions from Power Sector Version 3*

Data / Parameter:	*EG historic 3 yr*
Data unit:	*MWh*
Description:	*Historic 3 year average net generation of existing plant*[7]
Source of data used:	*Plant records*
Value applied:	*2006/2007: 26,319* *2005/2006: 23,935* *2004/2005: 18,793* *3 year average: 23,016*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*The data for generation has been historically measured by energy meters situated on the site along with the power plant auxiliaries. Historically this data has been collected daily and has been held at the plant.*
Any comment:	*The time series data is provided in Annex 3*

Data / Parameter:	*BF pre-project y*
Data unit:	*Tonnes*
Description:	*Quantity of biomass used at plant prior to project activity*[8]
Source of data used:	*Plant records*
Value applied:	*2006/2007: 127,389 tonnes* *2005/2006: 103,264 tonnes* *2004/2005: 80,035 tonnes*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*This data is monitored daily be the agriculture department of VPPL, which monitors the amount of sugar cane coming in to the plant and the amount of juice extracted, which gives the amount of bagasse generate, to be used at the power plant..*
Any comment:	*This data is used to calculate pre-project efficiency*

Data / Parameter:	*NCV BF y*
Data unit:	*Kcal/kg*
Description:	*Gross Calorific value of biomass, based on 50% moisture content.*
Source of data used:	*Plant records*
Value applied:	*2270*
Justification of the	*The NCV is determined and certified by a third party agency.*

[7] Actual Generation Numbers from VPPL

[8] Project DPR Report (VPPL_DPR_Final.pdf)

choice of data or description of measurement methods and procedures actually applied :	
Any comment:	*This data is used to calculate pre-project efficiency, and used to estimate project activity efficiency.*

B.6.3 Ex-ante calculation of emission reductions:

Baseline emission

Determination of $EG_{,y}$:					
No	Notation	Parameter	Unit	Value	Comments
1.	EG per-project y	Gross generation of power from pre-project activity	MWh	2006/2007: 26,319 2005/2006: 23,935 2004/2005: 18,793	Actual value recorded by VPPL, value applied for calculation of 3 year average.
2.	EG total y	Total energy generation from all power generation source after project activity	MWh	94,323	Will be recorded with energy meters located on each turbine installed
2	EG project plant, y	Generation from the project activity	MWh	Phase I: 31,565 Phase II: 34,508 Total: 66,074	Will be recorded with energy meters located on each turbine installed
3	BF pre-project ,y	Fuel consumption Pre-Project activity	T	2006/2007 127,389 2005/2006 103,264 2004/2005 80,035	Actual value recorded by VPPL

4	BF per-project,y	Fuel consumption in heat equivalent	MWh	2006/2007 335,923 2005/2006 272,305 2004/2005 211,051	Calculated using net calorific value of 2270 kcal/kg
5.	BF project-plant, y	Fuel consumption Project Plant	T	Phase I : 135,000 Phase II : 180,000	Estimated, this will be replaced with actual numbers monitored for that period
6.	BF project-plant, y	Fuel consumption in heat equivalent	MWh	Phase I : 355,993 Phase II : 474,657	Calculated using net calorific value of 2270 kcal/kg
7.	(1/4)	Pre-project efficiency	MWh electricity/ MWh heat content	0.0851	3 year average from 2004-2007
8	(2/6)	Project Plant efficiency	MWh electricity/ MWh heat content	0.1834	4 year average from 2008-2012

As discussed in section B.6.1 emissions from the project activity and the leakages are considered to be zero in the project case. Therefore,

$ER_y = ER_{electricity,\ y}$

Now,

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

The table below demonstrates the annual CERs estimation:

CERs estimation	Units	Value
$EG_{total\ y}$ The net quantity of electricity generated in all power units at the project site, generated from firing the same type(s) of biomass residue as in the project plant, including the new power unit installed as part of the project activity and any previously existing units, during the year y.	MWh	Phase 1: 59,815 Phase 2: 94,323
$EG_{historic\ 3\ yr}$ The net quantity of electricity generated during the most recent three years in all power plants at the project site, generated from firing the same type(s) of biomass residue as used in the project plant.	MWh	23,016
$EG_{historic\ 3yr\ total}$ EG historic 3 year total $EG_{total\ y}$ - $EG_{historic\ 3\ yr}$	MWh	Phase 1: 36,799 Phase 2: 71,307
$EG_{project\ plant\ y}$ The net quantity of electricity generated in the project plant during the year	MWh	Phase I: 31,565 Phase II: 34,508 Total: 66,074

EG $_y$ The net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y in MWh, is the net quantity of electricity generated in the project plant during the year y Take less of the two (EG historic 3yr total or EG project plant y) EG $_y$ = EG $_{project\ plant\ y}$	MWh	Phase I: 31,565 Phase II: 34,508 Total: 66,074
Emission factor	t CO_2 e/MWh	0.85
Annual overall emission reductions	t CO_2 e/MWh	Phase I: 26,831 Phase II: 29,332 Total: 56,163

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

Year	Estimation of project activity emissions (tonnes of CO2e)	Emission reduction due to displacement of electricity (tonnes of CO2e)	Estimation of Leakage (tonnes of CO2e)	Estimation of overall emission reductions (tonnes of CO2e)
2008/2009	0	26,831	0	26,831
2009/2010	0	26,831	0	26,831
2010/2011	0	56,163	0	56,163
2011/2012	0	56,163	0	56,163
2012/2013	0	56,163	0	56,163
2013/2014	0	56,163	0	56,163
2014/2015	0	56,163	0	56,163
2015/2016	0	56,163	0	56,163
2016/2017	0	56,163	0	56,163
2017/2018	0	56,163	0	56,163
Total (tonnes of CO2e)	0	502,966	0	502,966

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

B.7.1. Data and parameters monitored:

Data / Parameter:	*EF_y*
Data unit:	*t CO_2e /MWh*
Description:	*Emission Factor*
Source of data to be used:	*Calculated from the weighted average of the Simple operating margin and Build margin*
Value of data	*This will be determined ex-post, the value applied for the purpose of calculating emission reduction is from published data by the CEA. 0.86 t CO_2e/MWh*
Description of measurement methods and procedures to be applied:	*Calculated variable*
QA/QC procedures to be applied:	
Any comment:	*Grid emission factor has been estimated by Central Electricity Authority (CEA) and is based on methodology guidelines as explained in ACM0002*

Data / Parameter:	*$EG_{project\ plant\ y}$*
Data unit:	*MWh*
Description:	*Net quantity of electricity generated in the project plant during the year y*
Source of data to be used:	M/S Venkateshwara Power Project Ltd. (VPPL)
Value of data	*This value will be determined annually from the records maintained at the factory. However, for estimation of emission reductions this value has been estimated as:* *Phase 1 - 31,565 MWh* *Phase 2 - 34,508 MWh* *Total - 66,074 MWh.*
Description of measurement methods and procedures to be applied:	*The hourly recordings of data will be taken from energy meters located at the project activity site. This data will be recorded hourly by the shift attendant and entered into logbooks on site. This hourly data will be signed off at the end of every shift by an engineer in charge of the shift and again at the end of each day and signed off by the power plant manager. The*

	energy meters will be calibrated annually by an independent third party.
QA/QC procedures to be applied:	*This parameter may be checked with the quantity of biomass fired, i.e. show that the electricity generation divided by the quantity of biomass fired results in a reasonable efficiency as compared with the previous year.*
Any comment:	*Data will be held for a period of 2 years after the end of the crediting period.*

Data / Parameter:	$EG_{total\ y}$
Data unit:	*MWh*
Description:	*Net quantity of electricity generated in all power units at the project site, generated from firing the same type(s) of biomass residue as in the project plant, including the new power unit installed as part of the project activity and any previously existing units in year y*
Source of data to be used:	M/S Venkateshwara Power Project Ltd. (VPPL)
Value of data	*This value will be determined annually from the records maintained at the factory. However, for estimation of emission reduction this value has been estimated as:* *Phase 1 - 31,565 MWh* *Phase 2 - 34,508 MWh* *Total – 94,323 MWh*
Description of measurement methods and procedures to be applied:	*The data from the project activity will be monitored as set out above, for the existing power plant hourly recordings of data will be taken from energy meters located at the site*
QA/QC procedures to be applied:	*This parameter may be checked with the quantity of biomass fired, i.e. show that the electricity generation divided by the quantity of biomass fired results in a reasonable efficiency as compared with the previous year.*
Any comment:	*Data will be held for a period 2 years after the end of the crediting period.*

Data / Parameter:	$BF_{i\ y}$
Data unit:	*Tonnes of dry matter*
Description:	*Quantity of biomass residue type i used for combustion in the project plant during year y*
Source of data to be used:	M/S Venkateshwara Power Project Ltd. (VPPL)
Value of data	*This value will be determined annually from the records maintained at the factory. However, for estimation of emission reduction this value has been estimated as:*

	Phase I : 135,000 tonnes *Phase II : 180,000 tonnes*
Description of measurement methods and procedures to be applied:	*The actual weight of biomass residues will be measured using a belt weigher. The data recording will be done continuously, and also will be cross checked with the annual material and energy balance. 100% of the data will be monitored and will be archived both electronically and on paper*
QA/QC procedures to be applied:	*Consumption data will be verified with VPPL on-site measurement records supported by vouchers for quantity of biomass residues purchased and corresponding changes in the stock.*
Any comment:	*The quantity of biomass purchased is assumed to be equal to the quantity combusted (i.e., all purchased biomass is combusted). The data will be archived two years after the end of crediting period.*

Data / Parameter:	*Auxiliary Consumption Project Plant*
Data unit:	*MWh*
Description:	*Power used to operate co-generation plant.*
Source of data to be used:	*M/S Venkateshwara Power Project Ltd. (VPPL)*
Value of data	*This value will be determined annually from the records maintained at the factory. However, for estimation of emission reduction this value has been estimated as 10% of gross power production:* *Phase I : 6,646 MWh* *Phase II : 10,480 MWh*
Description of measurement methods and procedures to be applied:	*Auxiliary consumption will be subtracted from the total generation, to give net generation. Net generation will be used fro emission reduction calculation.*
QA/QC procedures to be applied:	*The data from the project activity will be monitored as set out above, for the existing power plant hourly recordings of data will be taken from energy meters located at the site*
Any comment:	*The quantity of biomass purchased is assumed to be equal to the quantity combusted (i.e., all purchased biomass is combusted). The data will be archived two years after the end of crediting period.*

B.7.2 Description of the monitoring plan:

The monitoring of electricity data revolves around the power generation from the turbine generators and the auxiliary consumption of the power plant. All auxiliary units at the power plant will be metered and there will also be main meters attached to each turbine generator to determine their total generation.

The management of the plant will designate one person to be responsible for the collation of data as per the monitoring methodology. The designated person will collect all data to be monitored as mentioned in this project design document (PDD) and will report to the head of the plant. The overall CDM project management responsibility will remain with the Plant Head.

The electricity generation from turbines and auxiliary consumption will be recorded continuously on an hourly basis by the operators in the shift. At the end of the day this data will be collated by the engineer in charge and signed off by the power plant manager. The data will be recorded in logbooks by the operators and the engineer in charge will collate the data from these log books and store them electronically. The data will also be monitored on a continuous basis through a DCS system, and be used as a back up and also as a cross check for the meter readings. This data will be used by engineer in charge to prepare a monthly report and send it to plant GM for verification. The monthly reports will be reviewed by the management during the quarterly review meeting, and will be sent to consultants for estimation of monthly emission reductions. The monitoring personnel are familiar with the process of monitoring and documentation. They have been maintaining and reviewing the factory records pertaining to the sugar manufacturing; however, their training needs will be identified and attended. All the meters will be checked and calibrated each year by an independent agency and they will be maintained as per the instructions provided by their suppliers. Hence there will be no uncertainties or adjustments associated with data to be monitored.

An internal audit team, comprising of personnel from the factory but from a department other than utility, will review the daily reports, monthly reports, procedure for data recording and maintenance reports of the meters. This team will check whether all records are being maintained as per the details provided in the PDD. The audit team will also enlist the modifications/corrective actions required, if any, in more accurate monitoring and reporting. All the data and reports will be kept at the offices of the sugar mill until 2 years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later.

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

Organization:	BalanceCO2 Ltd.
Date of Completion	October 2007

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:

Phase	Start of construction	Commissioning date
Phase I	March 2008	October 2008
Phase II	March 2009	October 2010

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

20 years

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

Fixed ten years

C.2.1. Renewable crediting period

Not applicable.

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

Not applicable.

C.2.1.2. Length of the first crediting period:

Not applicable.

C.2.2. Fixed crediting period:

Chosen crediting period

C.2.2.1. Starting date:

01/11/2008

C.2.2.2. Length:

10 years

SECTION D. Environmental impacts

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

During the operation of the power plant a yearly consent will be obtained from the Karnataka state Pollution Control Board for air and water pollution. That the project meets the stipulated limits will be monitored as part of the overall CDM process their compliance will be reported at annual verification.

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:

Host party regulations requires VPPL to obtain environmental clearance in the form of "No objection Certificate" from Karnataka Pollution Control Board. The other condition is that the site of the project is to be approved from the environmental angle and that the Environmental Management Plans are to be prepared and submitted to the pollution control board. VPPL had prior to implementation of project activity, notified to the Karnataka State Pollution Control Board (KSPCB) for necessary evaluation and approval, as required for implementation of the project activity. Project participants had studied the possibility of environmental impacts and concluded that no negative impacts are possible due to the project activity. Hence, no documentation or summary is provided here.

The assessment has been carried out by Karnataka Pollution Control Board, and has been concluded that no significant environmental impacts exist for this project activity therefore VPPL has obtained environmental clearance from Karnataka Pollution Control Board.

SECTION E. Stakeholders' comments

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

For the purpose of seeking comments and local stakeholder views on the project activity, stakeholder meeting had been organised by VPPL management on January 29 2008, inviting representatives from local community, comprising of cane growers. The meeting was called upon through a invitation send out be person to the local villages, informing stakeholders that the project will be undertaken and inviting comments.

The residents of the surrounding areas did not have any adverse comments about the activity. Farmers appreciated the local employment growth resulting from the activities being performed at the site and also appreciated the long term goal of VPPL in expanding the sugar factory and becoming a more stable and successful sugar industry in the near future. The activity has also resulted in increased infrastructure being setup in these remote parts of Karnataka.

E.2. Summary of the comments received:

There were no adverse comments from the stakeholders.

Summary of comments received during the meeting are as outlined below:

- People were appreciative of the new employment opportunities now created because of the project activities.
- The local infrastructure like Roads to the sites has helped in upbringing the facilities in the remote parts of India.
- The Power generated from the co-generation plant for export to the regional grid helps the Southern Grid and the surrounding villages, as a result achieve fulfillment of the demand of electricity in a cleaner form.

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

There were no adverse comments received for the activities performed under these Projects. Thus there were no actions taken in addition to the regular project activity.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	M/S VENKATESHWARA POWER PROJECT LTD. (Sugar Factory)
Street/P.O.Box:	
Building:	Admn. Off.: A/p.Bedkihal
City:	Tal. Chikodi, Dist. Belgaum
State/Region:	Karnataka
Postfix/ZIP:	591 214
Country:	India
Telephone:	(08338) 261057
FAX:	(08338) 262957
E-Mail:	E-mail: vppl@mahadikgroup.com
URL:	
Represented by:	Shri S.M Mahadik
Title:	Chairman/M.D.
Salutation:	
Last Name:	Mahadik
Middle Name:	Mahadevrao
First Name:	Swaroop
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The project has not received any public funding and Official Development Assistance (ODA).

Annex 3

BASELINE INFORMATION

Please refer to CEA Carbon Dioxide Emission Database Version 3.0
http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

COMBINED MARGIN	
Particulars	**Specific emission (tCO_2/MWh)**
Operating Margin	1.00
Build Margin	0.71
Combined Margin	**0.85**

Annex 4

MONITORING INFORMATION

Metering Equipment used for Export Power

Metering

The delivered Energy shall be metered at the high voltage side of the step up transformer installed at the project site.

Metering Equipment

Metering equipment shall be electronic trivector meters of accuracy class 0.2% required for the Project (both main and check meters). The main meter shall be installed and owned by the project proponent, whereas check meters shall be by the Karnataka Power Transmission Corporation Limited (KPTCL). The metering equipment shall be maintained in accordance with electricity standards. Such equipment shall have the capability of recording half-hourly and monthly readings. The project proponent shall provide such metering results to the KPTCL. The meters installed shall be capable of recording and storing half hourly readings of all the electrical parameters for a minimum period of 35 days with digital output.

Meter Readings

The monthly meter readings (both main and check meters) at the Project Site shall be taken simultaneously and jointly by representatives from KPTCL and VPPL. Facility to download recorded metering data through meter recording instrument is provided. At the conclusion of each metre reading as appointed representative of the KPTCL and the project proponent shall sign a document indicating the number of kilowatt-hours indicated by the meter.

Inspection of Energy Meters

The entire main and check energy meters (export and import) and all associated instruments, CP/PT transformers installed at the Project shall be of 0.2% accuracy class. Each meter shall be jointly inspected and sealed on behalf of KPTCL and VPPL and shall not be interfered with by either Party except in the presence of the other Party of its accredited representatives.

Meter Test Checking

All the main check meters shall be tested for accuracy every calendar year, as it is common practice in India that meters are tested once a calendar year. With reference to a portable standard meter which shall be of an accuracy class of 0.2%. The portable standard meter shall be owned by KPTCL and be tested and certified at least once every year against an accepted laboratory standard meter in accordance with electricity standards. The meters shall be deemed to be working satisfactory if the errors are within specification for meters of 0.2% accuracy class. If during any of the monthly meter readings, the variation between the main meter and the check meter is more than the permissible for meters of 0.2% accuracy class; all the meters shall be re-tested and calibrated immediately.