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

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Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

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Bagasse based Cogeneration Project at Pudukkottai

Tamil Nadu, India

Version 01

September 2006.

A.2. Description of the project activity:

>>

Purpose of the project activity

This project activity involves implementation of a bagasse based cogeneration plant ("project activity"), which commenced operation in March 2006. The primary objective in developing the project activity is to increase the efficiency of energy generation from sugar mill generated bagasse by replacing the existing low efficiency cogeneration system with a high efficiency system. The resulting incremental electricity generation is exported to the grid.

EID Parry India Limited (EID Parry) belongs to the Murugappa Group, which has evolved into one of the biggest industrial houses in India. The company has been a pioneer in many fields, setting up of India's first Sugar plant at Nellikuppam (1842), fertiliser plant at Ennore and sanitary ware plant at Ranipet. EID Parry has now four sugar mills at Nellikuppam, Pugalur, Pudukkottai and Pettavaithallai. EID Parry has won the Green Tech Award on Safety in Sugar mills and has obtained ISO 14001 certification for its sugar plants in Pudukkottai & Nellikuppam. EID Parry is well known for conformance to environmental standards even before they become mandatory. EID Parry being progressive and to be competitive in the open market economy of India, has took initiatives in developing this project under the Clean Development Mechanism (CDM) of United Nations Framework Convention for Climate Change.

The project activity is located at Kurumbur village-Aranthangi Taluk, Pudukkottai district in the Indian subcontinent. The cogeneration plant is a part of the existing sugar mill at Pudukkottai. The average crushing capacity of the sugar factory is 4000 tonnes of cane per day (TCD). The co-generation plant includes a double extraction cum condensing turbo generator of 18.55 MW capacity with a 100 ton per hour boiler (bi-drum, natural circulation water tube type) with outlet steam parameters, 86 kg/cm^2 and 510 ± 5^0C. The cogeneration plant would operate for around 250 days during the crushing season and around 50 days in the off-season. The power export to the TNEB from this project would be around 11

MW in season period and 15 MW in the off-season. The project activity during the identified crediting period (2007-2016), would result in an incremental electricity of approximately 101.68 MU every year.

Project's contribution to sustainable development:

Conservation of natural resources and environment:

The project activity reduces exploitation of natural resources (fossil fuels) for energy generation by supplementing the local electricity grid with a sizeable quantity (101.68 MU/annum) of clean power. The project uses the most efficient and environment friendly technology and reduces 922,950 tonnes of carbon dioxide emissions over ten years. Further, the project reduces other negative environmental aspects of conventional power plants like emission of particulate matter, ash disposal etc. The project promotes the usage of renewable sources for power generation by successful demonstration of biomass based power generation.

Contribution to Socio-economic development:

The export of electricity to the grid aids to reduce power outages thereby improving industrial output resulting in economic development of the region. The improved power situation encourages new small and medium industries that improve the rural employment scenario.

The project aids in socio-economic development even as it conserves natural resources and provides environmental benefits and thus it may be considered as contributing to sustainable development.

A.3. Project participants:

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Name of Party involved (*) (host indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant
India (Host Country)	EID Parry India Limited (Private Entity)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

>>
India

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

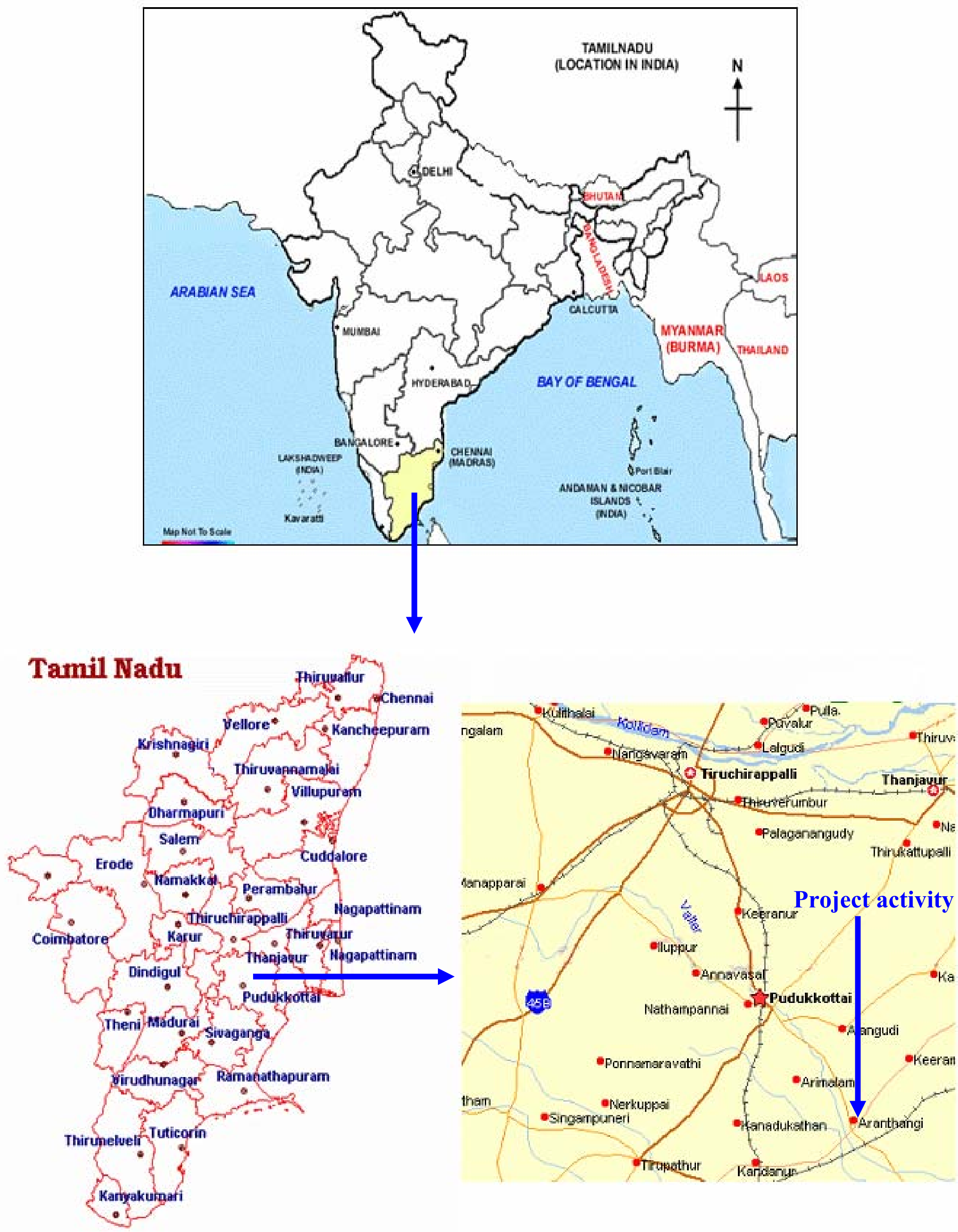
>>
Tamil Nadu

A.4.1.3. City/Town/Community etc:

>>
Kurumbur Village – Aranthangi Taluk, Pudukkottai district

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

>>
The project activity is located at Kurumbur Village-Aranthangai Taluk, Pudukkottai district in the Indian state of Tamil Nadu. The district lies around 78.25' and 79.15' East Longitude & 9.50' and 10.40' North Latitude. The project activity is located adjacent to the existing sugar plant. The area is sparsely populated with industries. The nearest railway station is Pudukkottai, which is approximately 20 kilometres away from the project site and Pudukkottai district has a coastline of 39 kilometres along Bay of Bengal. Power produced by the project activity will be stepped from 11 KV to 110KV to synchronise it with the grid and will be supplied to sub station at Alianilai, which is around 6 kilometres from Project site. Site conditions, availability of space, transport facility, fuel, water, convenience of interconnection with electrical grid for the power evacuation etc., were studied before implementation of the project.


TAMILNADU
(LOCATION IN INDIA)
N
DELHI
BHUTAN
BANGLADESH
LAOS
ARABIAN SEA
CALCUTTA
MUMBAI
MYANMAR
(BURMA)
THAILAND
HYDERABAD
BAY OF BENGAL
BANGALORE
CHENNAI
(MADRAS)
LAKSHADWEEP
(INDIA)
Port Blair
ANDAMAN & NICOBAR
ISLANDS
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Tamil Nadu
Thiruvallur
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Villupuram
Dharmapuri
Salem
Cuddalore
Erode
Namakkal
Perambalur
Nagapattinam
Thiruchirappalli
Coimbatore
Karur
Thiruvarur
Thanjavur
Nagapattinam
Dindigul
Pudukkottai
Theni
Madurai
Sivaganga
Virudhunagar
Ramanathapuram
Thirunelveli
Tuticorin
Kanyakumari
Kulithalai
Kollidam
Pulla
Puvalur
Lalgudi
Nangavaram
Tiruchirappalli
Thanjavur
Thiruverumbur
Palaganangudy
Thirukattupalli
Manapparai
Project activity
Keeranur
Iluppur
Annavasal
Pudukkottai
Nathampannai
Alangudi
Ponnamaravathi
Keeran
Arimalam
Nerkuppai
Singampuneri
Kanadukathan
Aranthangi
Tirupathur
Kandanur

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

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The project activity may be classified as a renewable energy project since it uses renewable biomass to generate electricity and export to the grid. Therefore the project activity is categorized under Category 1: Energy industries (renewable - / non-renewable sources) as per the scope of the project activities enlisted in the latest 'List of Sectoral Scopes' for accreditation of operational entities.

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

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EID Parry has installed a high pressure Steam-Rankine cycle replacing the existing low pressure system. Steam-Rankine cycle is one of the commercial methods available for power generation in the MWs scale. The process involves circulation of working fluid (steam) around the cycle by creating high pressure steam in the boiler which drives an expander (TG) to generate power. When an alternator is connected to the TG's shaft, electricity is generated. EID Parry's new project plant and the low pressure system used earlier are both based on this cycle. The project activity constitutes a boiler of capacity 100TPH with outlet parameters of 86 kg/cm^2 & 510 ± 5^0C using biomass as fuel, an 18.55 MW extraction cum condensing turbo-generator and auxiliary equipments. The high-pressure configuration of the system is technologically advanced, modern and highly efficient. EID Parry is among the few sugar mills in the country in proposing this configuration. Moreover, the project has adopted an air-cooled steam condenser against conventional practice of water cooled condensers. This would conserve huge volumes of water required for evaporative cooling, which is replaced by circulation of atmospheric air.

The accessories and auxiliary systems for the 18.55 MW cogeneration scheme include:

1) Pneumatically controlled bagasse handling system
2) Air cooled condenser
3) Firing system with re-injection system to save unburnt fuel
4) Feed water system fitted with conductivity meter to ensure quality of feed water
5) All electric motors and fans fitted with Variable Frequency Drives
6) De-aerator and Reverse Osmosis systems for feed water supply
7) Electrostatic precipitator to keep stack emissions under permissible levels
8) Effluent treatment plant, Ash handling system to take care of waste water and ash respectively
9) Distributed Control System (DCS)
10) Fire Protection System
11) Air conditioning and ventilation system for control room

12) Compressed air system for instruments and control systems
13) Electrical systems & lightning protection system, for its successful operation
14) Switchyard and power evacuation facilities of higher standards

The power generated would meet the captive electricity requirements of the sugar factory and extraction steam would meet the process steam requirements. The surplus electricity is exported to the TNEB grid.

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

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Year	Annual estimation of emission reductions in tonnes of tCO_2e
2007	92,295
2008	92,295
2009	92,295
2010	92,295
2011	92,295
2012	92,295
2013	92,295
2014	92,295
2015	92,295
2016	92,295
Total estimated reductions (Tonnes of CO_2e)	**922,950**
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	92,295

A.4.5. Public funding of the project activity:

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There is no public funding for the project activity.

SECTION B. Application of a baseline and monitoring methodology

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

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Title: Consolidated baseline and monitoring methodology for grid-connected electricity generation from biomass residues (ACM0006)

Reference: This consolidated baseline and monitoring methodology (ACM0006) is based on elements from the following methodologies:

- AM0004: "Grid-connected Biomasss Power-Generation that avoids uncontrolled burning of biomass which is based on the A.T Biopower Rice Husk Power Project in Thailand."
- AM0015: "Bagasse-based cogeneration connected to an electricity grid based on the proposal submitted by Vale do Rosario Bagasse Cogeneration, Brazil."
- NM0050: " Ratchasima SPP Expansion Project in Thailand."
- NM0081: "Trupan biomass cogeneration project in Chile."
- NM0098: "Nobrecel fossil to biomass fuel switch project in Brazil"

This methodology also refers to the ACM0002 ("Consolidated baseline methodology for grid-connected electricity generation from renewable sources") and the latest version of the *"Tool for the demonstration and assessment of additionality"*.

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

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Among the methodologies approved by UNFCCC for biomass based CDM project activities, ACM0006 has been chosen as most suitable to this project activity. The project activity meets the applicability conditions of ACM0006, as demonstrated below:

Conditions of ACM0006	**Applicability to project activity**
Applicable to grid connected and biomass residue fired electricity generation project activities	Bagasse fired in the project activity is a biomass residue. The project activity is connected to the TNEB grid to which it exports surplus electricity
Project activity may include the installation of a new biomass power generation plant at a site where currently no power generation occurs	Not relevant to the project activity
May be based on the operation of a power generation unit located in an agro-industrial plant generating the biomass residues	Based on the efficiency improvement of a power generation unit located in a sugar plant
Biomass residues are defined as *biomass* that is a by-product, residue or waste stream from agriculture, forestry and related industries. This shall not include municipal waste or other wastes that contain fossilized and/or non-biodegradable material.	Bagasse used in the project activity is a residue from agriculture related industry (sugar plant)
No other biomass types than *biomass residues*, as defined above, are used in the project plant and these biomass residues are the predominant fuel used in the project plant (some fossil fuels may be co-fired).	Bagasse will be used as the predominant fuel, however, some amount of coal may be co-fired during drought or other emergency situations
For projects that use biomass residues from a production process (e.g. production of sugar or wood panel boards), the implementation of the project shall not result in an increase of the processing capacity of raw input (e.g. sugar, rice, logs, etc.) or in other substantial changes (e.g. product change) in this process.	The project activity uses the residue (bagasse) from sugar manufacturing. The production process is independent of the project activity and shall not result in increase of the sugar plant crushing capacity.
The biomass used by the project facility should not be stored for more than one year.	Bagasse is not stored on the site for more than one year.
No significant energy quantities, except from transportation of the biomass, are required to prepare the biomass residues for fuel combustion	The preparation of bagasse doesn't involve significant energy consumption. Some quantity of energy may be used for biomass transportation from outside during unavailability of bagasse.

The methodology is only applicable for the 16 combinations of project activities and baseline scenarios identified in the methodology.	Project activity fits in scenario 14.

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

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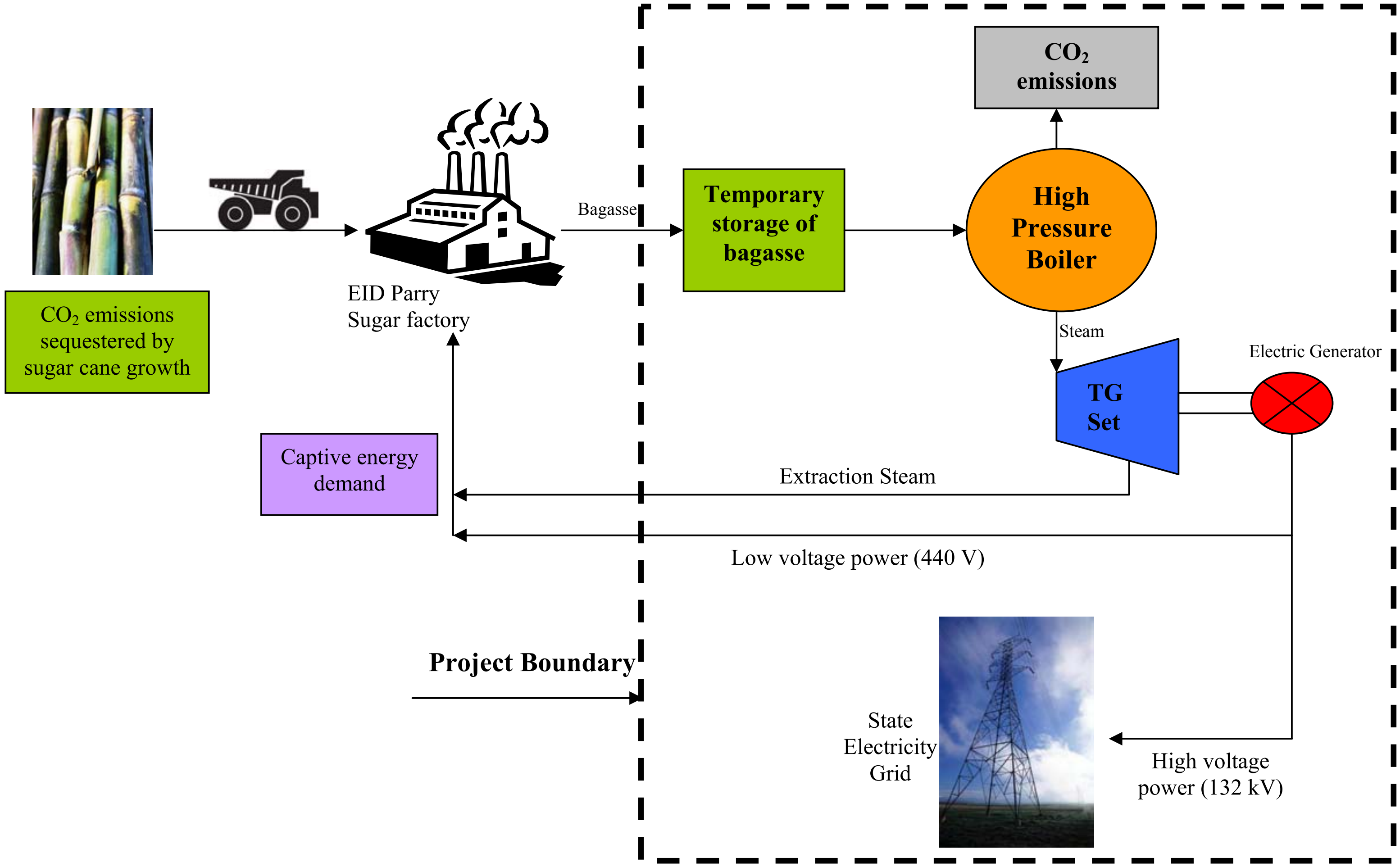
Figure B.3: Project Boundary



The project participants have included in the project boundary, GHG emissions sources from the project activity and emission sources in the baseline, as prescribed by the methodology ACM0006. The project boundary includes the following emission sources:

	Source	Gas		Justification/Explanation
Baseline Scenario	Grid Electricity Generation	CO_2	Included	Main Emission source.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Heat Generation in Onsite boilers	CO_2	Excluded	Heat generation is using biomass as fuel.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Decay or uncontrolled burning of surplus biomass	CO_2	Excluded	No surplus biomass
		CH_4	Excluded	No surplus biomass
		N_2O	Excluded	No surplus biomass
Project Scenario	Onsite fossil fuel combustion due to the project activity	CO_2	Included	Important emission source.
		CH_4	Excluded	Excluded for simplification. This quantity is very small.
		N_2O	Excluded	Excluded for simplification. This quantity is very small.
	Offsite transportation of	CO_2	Included	An important emission source.

	biomass	CH_4	Excluded	Excluded for simplification. This quantity is very small.
		N_2O	Excluded	Excluded for simplification. This quantity is very small.
	Combustion of biomass for electricity and/or heat generation	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	This emission source must be included only if CH4 emissions from uncontrolled burning or decay of biomass in the baseline scenario are included.
		N_2O	Excluded	Excluded for simplification. This quantity is very small.
	Biomass storage	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	Excluded for simplification. Since biomass is stored for not longer than one year, this emission source is assumed to be small.
		N_2O	Excluded	Excluded for simplification. This quantity is very small.

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

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As prescribed by ACM0006, project participants have determined the most plausible baseline scenario among all realistic and credible alternatives separately regarding:

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

The following paragraphs illustrate the various potential alternatives, and the most plausible baseline scenario is determined using steps 3 (Barrier analysis) of the "tool for the assessment and demonstration of additionality" as prescribed by the methodology.

Power generation: How power would have been generated in the absence of the project activity?

Alternatives available for power generation:

1. *Option P5: Continuation of power generation at the existing power plant fired with the same type of biomass as the project activity, and implementation of the project activity not undertaken as a CDM project activity, at the end of the lifetime of the existing plant*
2. *Option P1: Implementation of the project activity not undertaken as a CDM project activity*
3. *Option P4: Power generation in existing and/or new grid connected power plants*

Identification of most likely baseline power generation scenario using barrier analysis:

In Option P5 scenario, the project proponent would use a lower efficient cogeneration plant compared to the project activity, which would result in consumption of the entire bagasse to generate steam and power for in-house utilization or captive consumption only. Though this alternative does not entail surplus power generation and export to an electricity grid, it is in compliance with all applicable legal and regulatory requirements and could be the baseline.

In India, all the sugar mills have their own cogeneration units, most of them operating with low-pressure boiler configuration of below 45 kg/cm^2 (Maximum are in the range of 21 kg/cm^2 to 45 kg/cm^2) 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.

Prior to the 18.55 MW cogeneration plant, the sugar mill was equipped with two boilers, a 51.5 TPH and 29 TPH with parameters 17 kg/cm^2 and 280^0 Centigrade and two turbines of capacities 2.0MW and 2.5MW were existent to meet the energy requirements of the sugar mill and would have continued operating till the end of the crediting period. 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 lower pressure produce less power (as compared to EID Parry's 86 kg/cm^2) and are less capital intensive. EID Parry had an option to continue operating its low pressure cogeneration system as against selected configuration of 86 kg/cm^2 outlet boiler pressure, which would incur a high capital outlay. Moreover, the other investment barrier to the project activity was the uncertainty of the financial returns, which is sensitive to tariff change and climatic risks (cane availability). There are also no legal and regulatory requirements for continuation of the low pressure system. However, they have implemented "modern and energy efficient technology", which was available in the country at the time of implementation of the project activity. In cognizance of the investment barriers and other barriers, EID Parry opted for implementation of the high pressure system (Option P1) considering that the CDM incentive would improve the long term financial sustainability of the project activity.

The existing generation mix of the southern regional grid is dominated by fossil fuel power plants and future capacity additions planned are largely from fossil fuel based power plants. Therefore, in the BAU scenario, the grid is likely to remain as a GHG emission intensive power source.

Barriers	**Option**		
	P5	**P1**	**P4**
Investment	No	Yes	No
Technological	No	Yes	No
Common practice	No	Yes	No
Institutional	No	No	No

The most likely baseline power generation scenario would be a combination of Option P5 and Option P4.

Heat (steam) generation: How heat would be generated in the absence of the project activity?

Alternatives available for heat generation:

1. *Option H5: Continuation of heat generation in the existing low pressure cogeneration plant (old boiler) fired with the same type of biomass (i.e. bagasse and biomass) as in the project activity and implementation of the project activity not undertaken as a CDM project activity, at the end of the lifetime of the existing plant.*
2. *Option H1: Implementation of the project activity not undertaken as a CDM project activity.*

Identification of most likely baseline heat generation scenario using barrier analysis:

Since the project activity is a cogeneration activity, the alternatives for heat generation are similar and associated to the alternatives for power generation. Therefore, analysis of the power generation alternatives applies as well to heat generation.

In the pre-project scenario, the process heat requirement of the sugar factory has been met by steam from the exhaust of the backpressure turbines of the old low pressure cogeneration system. In the absence of the project activity, the low pressure cogeneration system would have continued to operate without any problems till the end of the crediting period and the factory would have continued to meet its heat requirement from the system. There is no policy or regulation enforcing the replacement of the low pressure system with the capital intensive high pressure system. EID Parry could have continued heat generation in the low pressure system.

Barriers	**Option**	
	H5	**H1**
Investment	No	Yes
Technological	No	Yes
Common practice	No	Yes
Institutional	No	No

The most likely baseline heat generation scenario would be Option H5.

Biomass: What would happen to the biomass in the absence of the project activity?

Alternatives available for biomass:

1. *Option B2: The biomass would have been used for heat and/ or electricity generation at the project site*
2. *Option B1: Left to decay without utilizing it for energy purposes or Option B3: Sold off and used for power generation at other sites:*

Identification of most likely baseline biomass scenario using barrier analysis:

In the absence of the project activity bagasse would have been used to generate heat and power (required for captive consumption only) at the project site by the old boiler and turbine configuration. Refer to description of this under “alternatives for power generation” above.

Prior to the implementation of the project activity, the bagasse generated in-house was used in the low pressure cogeneration system. Since the efficiency of low pressure system is very low, the entire bagasse generated would be used to meet only the captive energy requirements with no surplus bagasse. This would have continued to be the scenario in the absence of the CDM project activity. Therefore, the options B1 and B3 are not the likely alternatives in the absence of the project activity.

Barriers	Option	
	B2	B1, B3
Investment	No	Yes
Technological	No	Yes
Common practice	No	Yes
Institutional	No	No

The most likely baseline biomass scenario would be Option B2.

Most plausible baseline scenario for the project activity:

The above analysis shows that the most likely baseline scenario is a combination of:

- Option P4 and P5: Continuation of power generation at the existing power plant (old boiler with lower efficiency) fired with the same type of biomass as the project activity and partly in existing and/or new grid connected power plants.
- Option H5: Continuation of steam generation from bagasse
- Option B2: Use of biomass to generate heat and power at the project site

Baseline scenario 14 of ACM0006 is the applicable baseline scenario for the project activity.

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): >>

In order to demonstrate that the CDM project activity reduces anthropogenic GHG emissions that would have occurred in the absence of the project activity, it is necessary to prove that:

- The implementation of the project activity is not the baseline scenario, (i.e., EID Parry not exporting power to the grid, there would be no increase in efficiency of biomass combustion in the project plant and thereby no change in the way heat is generated).

ACM0006 prescribes the use of the “Tool for the demonstration and assessment of additionality” (Figure B5.1) for the above purpose, which is applied to the project activity as described further:

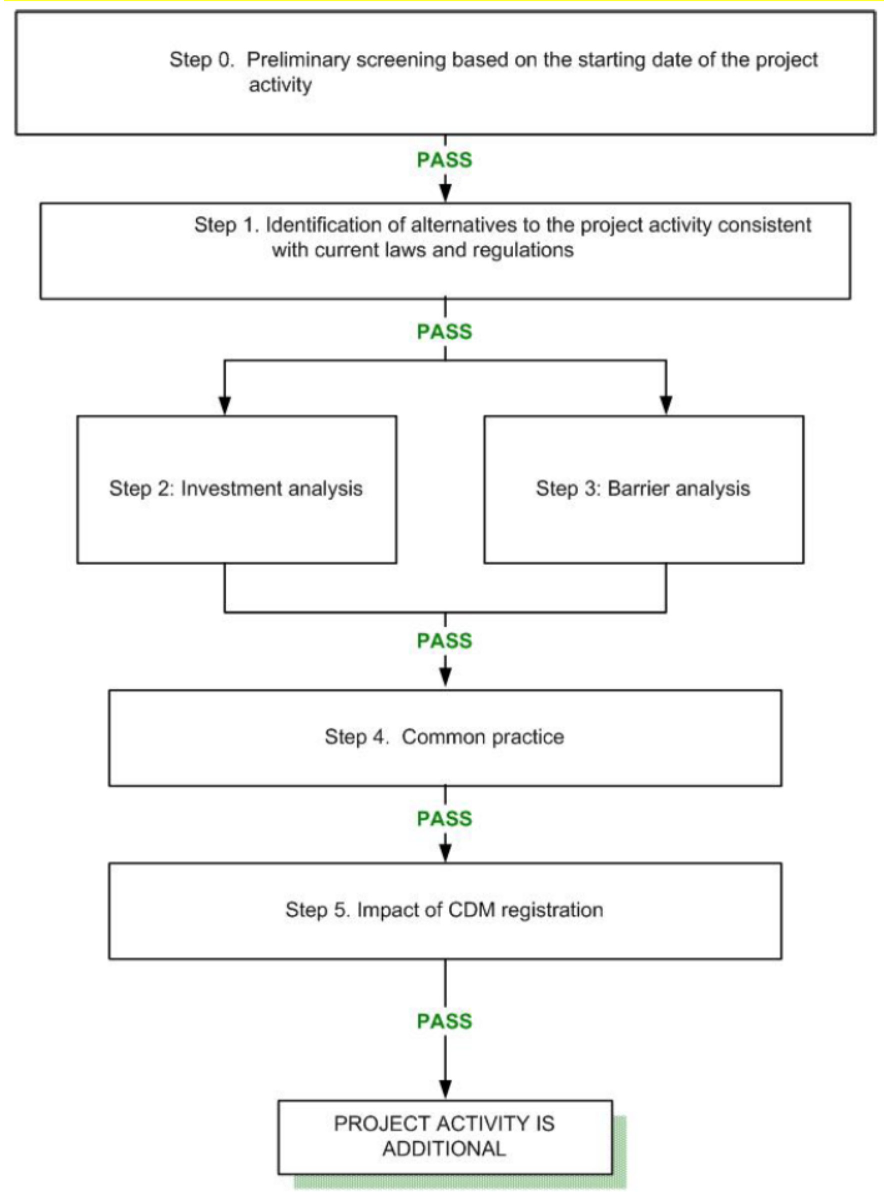


Fig B5.1 Flowchart for demonstrating additionality of the project

Step 0: Preliminary screening based on the starting date of the project activity

During conceptualisation of the project activity, EID Parry was aware of the GHG emission reduction potential and the prospective carbon credits, and therefore decided to implement it as a CDM project activity. The proposal of the project activity was submitted to EID Parry's Management for approval on November 15, 2004. The proposal provided preliminary estimates of the financial incentives the project activity would receive over the crediting period from sale of Certified Emission Reductions (CER) under Clean Development Mechanism and would serve as proof for consideration of CDM. The various aspects of the proposal were discussed in the Board of Director's Meeting held subsequently in which EID Parry's management took a decision to go ahead with the project by securing the finance partially from HDFC & SDF, and partially through internal accruals so as to invest in the project activity. EID Parry considered the prospective CDM revenues as an additional source of income that could offset risks faced by the project activity.

Step 1 - Identification of alternatives to the project activity consistent with current laws and regulations

Project participants have determined the most plausible baseline scenario among all realistic and credible alternatives separately regarding:

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

The sub-steps include:

- **Sub-step 1a. Define alternatives to the project activity**
- **Sub-step 1b. Enforcement of applicable laws and regulations**
    - In sub-step 1a and 1b, EID Parry is required to identify realistic and credible alternative(s) that were available to EID Parry or similar project developers that provide output or services comparable with the project activity. These alternatives are required to be in compliance with all applicable legal and regulatory requirements. EID Parry identified the different potential alternative(s) to project activity available to all other sugar-manufacturing units in India. The alternatives have been analysed using (step3: Barrier analysis of the "Tool for demonstration of Additionality") and the most plausible baseline scenario has been identified in Section B.4.

Summary on alternatives

Considering the alternatives explained in section B.4 above, it can be inferred that for the project activity, the most likely alternatives consistent with current laws and regulations are

1. A combination of:
   - Option P4 and P5: Continuation of power generation at the existing power plant (old boiler with lower efficiency) fired with the same type of biomass as the project activity and partly in existing and/or new grid connected power plants.
   - Option H5: Continuation of steam generation from bagasse
   - Option B2: Use of biomass to generate heat and power at the project site
2. The implementation of the project activity not undertaken as a CDM project activity.

The next step for additionality justification as per the Fig B5.1 is either

- **Step 2 - Investment analysis (OR)**
- **Step 3 - Barrier analysis**

As EID Parry has faced barriers and risks during the implementation of the project activity, it is discussed in greater detail in order to further elaborate on the reasons due to which, the alternative 2 cannot be the baseline. In view of overall project scenario, EID Parry proceeds to establish project additionality by conducting 'Barrier Analysis' as under.

Step 3: Barrier Analysis

EID Parry is required to determine whether the project activity faces barriers that:

- Prevent the implementation of this type of project activity; and
- Do not prevent the implementation of at least one of the alternatives

The above study has been done by means of the following sub-steps:

Sub-step 3a: Identification of barriers that would prevent the implementation of the project activity

The project activity had its associated barriers to successful implementation, which have been overcome by EID Parry to bring about additional green house gas reductions.

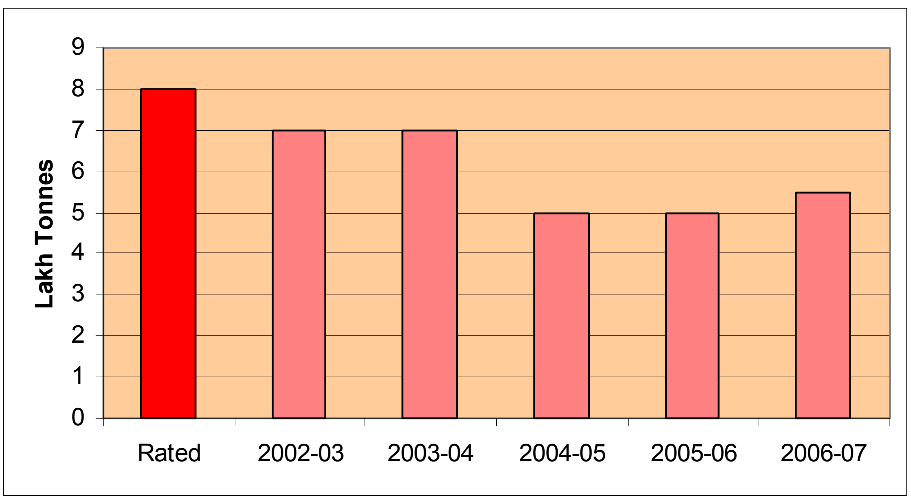
➢ **Investment barrier**

In 2004-05, EID Parry explored the opportunity to improve the operational margins of its Pudukkottai sugar factory by diversifying into surplus power generation and its export to the grid. A detailed study was conducted on the feasibility of surplus energy generation by adopting high pressure cogeneration system to improve the cogeneration efficiency. Though the study projected an acceptable rate of return through energy sales to the grid, the huge investment requirements and the sensitivity/vulnerability to climatic and tariff policy changes were major barriers for EID Parry to undertake the project.

- ***Sensitivity to climatic risks and tariff policy risks:***

The revenues from the project are mainly dependent on the quantity of power exported, generation cost and the tariff at which the TNEB purchases it. The quantum of power exported is directly dependent on the cane availability since bagasse is used as the primary fuel. The annual sugarcane availability fluctuates[1] (Refer Figure B 5.2 below) based on rainfall and regional climatic conditions and is highly unpredictable in nature. In periods of drought, cane output may reduce as much as 50% below normal, leading to a corresponding deficiency in bagasse. This would demand EID Parry to either reduce the power available for export or purchase high cost outside biomass. Both of these options would result in lower returns for EID Parry since the former would reduce the energy sale revenues while the later would increase the generation cost.

Figure B 5.2: Year-wise cane availability



The project is also vulnerable to electricity policy changes as the power purchase tariff prevailing now and agreed by TNEB is always liable to revision. The purchase tariff offered by TNEB is fixed at Rs.3.15 per kWh as compared to MNES's recommended purchase tariff of Rs.3.66 per kWh for 2004-05. Presently TNEB is under pressure to reduce[2] its power purchase cost from IPPs so that it can afford to

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[1] Year-wise graphs for production and yield of sugarcane in TamilNadu and India are given in Annex 5.

[2] http://tnerc.tn.nic.in/orders/MP%20263%20Nellikuppam%20krishnamurthy.pdf and http://tnerc.tn.nic.in/caselist.htm

lower power supply tariff to its consumers. Any downward revision of the purchase tariff will have serious negative impact on the project returns, as was the case with biomass power plants in the neighbouring Andhra Pradesh[3].

- ***High upfront cost:***

This project activity of high-pressure configuration entailed a high upfront cost as compared to the baseline scenario of continuing with the low-pressure configuration. Moreover, the investment required was significantly increased due to the installation of an air-cooled condenser (Refer "Water availability barrier" below) as against the conventional practice of water cooled condensers. EID Parry was sceptical about the huge capital outlay considering that the primary product (sugar) is cyclical in nature and hence seasonal income flows.

EID Parry by investing in higher cost, high efficiency renewable energy project is taking additional investment risk to over come the investment barriers. As per EID Parry's computations the project's internal rate of return is expected to improve marginally if the CDM funding is available by 2007 after registration at UNFCCC.

To summarise the above, EID Parry decided to invest in the energy efficiency project despite the huge capital outlay and apprehension about its returns which have significant uncertainties. The CDM revenues were considered to help offset financial losses that might arise out of realisation of the project risks in the long run.

➢ **Technological Barrier**

The typical alternative to the project activity is to have continued with the low pressure (17 kg/cm^2) cogeneration configuration. The project activity has adopted a high-pressure co-generation technology (86 kg/cm^2), which has low market share and less penetration. Low penetrated technology is related to efficiencies of major equipment, trouble-free plant operation, availability of spares, availability of skilled manpower to operate the plant continuously *etc*. EID Parry is among the first few companies in Tamil Nadu to take up the risk in overcoming the technology barrier by adopting 86 kg/cm^2 pressure and STG of double extraction cum condensing type.

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[3] The power tariff applicable for Non-Conventional Energy Source power projects as per MNES guidelines is Rs.2.25 per kWh with base year 94-95 with annual escalation of 5% for a period of 10 years. The tariff applicable for the year 2003-04 was Rs.3.48 per KWH. However, APERC revised the tariff effective from 1st April, 2004 to Rs.2.69/kWh. Moreover APERC limited the PLF of cogeneration projects to 55%. The energy exported in excess to 55% PLF will be paid at below cost tariff by APTRANSCO. The downward revision and the PLF limit imposed on biomass power plants by APTRANSCO, has affected their returns in a detrimental manner. It took a prolonged litigation by the biomass power promoters to bring a roll back of the tariff reductions in to effect.

The technological barriers become even more significant considering that EID Parry had to opt for an Air-cooled condenser as against the common practice of water cooled condensers. The plant O&M personnel had to be specially trained to operate this system.

- **Other Barriers**
  - ***Water availability barrier:***

The project activity is situated in a region where the availability of water is limited. The installation of an extraction cum condensing turbine requires plenty of cooling water for the condenser that is scarce in the region, posing as a significant barrier to the project. However, EID Parry, determined to facilitate the surplus power generation, surmounted the barrier by opting to install an air-cooled condenser in place of conventional water cooled condenser. Revenue from CDM is expected to compensate for the incremental capital investment (10% of total cost) and operational cost entailed.

- ***Managerial resources barrier:***

The sugar plant at Pudukkottai is in operation from March 2000. The region surrounding the plant is dominated by agriculture and there are no large industries nearby considering which, the trained manpower capable of handling a high-pressure configuration cogeneration system was not readily available to EID Parry. They therefore had to overcome this managerial resource barrier in order to implement the project activity.

- ***Organisational barrier:***

Traditionally the sugar-manufacturing sector belongs to agriculture sector with limited knowledge and exposure of complications associated with commercial production and sale of electricity. The bagasse based power projects is a steep diversification from the core rural economics to power sector economics, where the project proponents has to meet challenges of power policies, delivery/non-delivery of power, techno-commercial problems associated with electricity boards *etc*. EID Parry for long, been involved in business of sugar production and rural economics, had to transform (overcome barrier) and develop expertise to deal with the economics of electricity generation, distribution and dealing with power sector economics, bureaucracy *etc.*

- ***Institutional Barriers:***

EID Parry has signed Power Purchase Agreement (PPA) with TNEB. For their earnings, the project depends on the payment from TNEB against the sale of electricity to the grid. The PPAs are designed in favour of the state electricity authorities and enable them to dictate terms with respect to the quantity of energy delivered, tariff payable etc. EID Parry had to take this risk and face this institutional barrier on which they have limited or no control.

It is estimated that, of the total project proponents who get approval from central/state electricity authority to establish biomass based power projects in India, only a few are successful in commissioning of the plant due to some of the above mentioned barriers. EID Parry has overcome the above barriers and implemented the cogeneration energy efficiency project considering that the CDM funds would offset any financial losses from realisation of the project risks and hence the project activity may be considered additional.

- **Additionality test for Regulatory/Legal requirements**

There is no legal or regulatory binding on EID Parry to implement the project activity. The above tests and analysis suggest that the project activity is additional and the anthropogenic emissions of GHG by sources will be reduced below those that would have occurred in the absence of the registered CDM project activity.

Sub-step (3b). Show that the identified barriers would not prevent a wide spread implementation of at least one of the alternatives (except the proposed project activity already considered in step 3a):

The following demonstrates that the most likely alternative to the project activity (i.e. continuation of the existing low pressure system) doesn't face any of the barriers faced by the project activity:

Investment barrier: The existing system would not require significant funds for its continued operation. The climatic and tariff risks don't impact this alternative since it doesn't involve the export of power to grid.

Technical barrier: The existing system is a low pressure system that is well established and commonly prevalent.

Other Barriers: The existing system is in operation since the commissioning of the sugar plant and doesn't involve much of managerial resources for its optimal operation. Since the turbine is of back-pressure type and doesn't involve steam condensing, it doesn't face the barrier of water availability. The other institutional barrier cited for the CDM project activity is not applicable to the existing system since there is no export of power involved in this scenario.

The barriers associated with the CDM project activity do not exist for the alternative discussed above and thus do not prevent the wide spread implementation of these alternatives.

Step 4: Common Practice Analysis

The implementation of the project activity without CDM benefits is not a common practice for the sugar manufacturing units in similar socio-economic environment of Tamil Nadu State, which is substantiated by the table B5 below. The baseline scenario (cogeneration unit to meet the plant's energy requirements with no surplus power generation) is the most common practice adopted by the sugar- manufacturing units. The project is not a common practice since, in the similar project sector, socio-economic environment, geographic conditions and technological circumstances, the project activity uses an efficient technology.

Table B5: Common Practice Analysis for EID Parry project activity

Total number of Sugar Mills in TN	*38*
Cooperative Sugar Mills	*16*
Sugar Mills under private sector	*19*
Sugar Mills under public sector	*3*
Sugar Mills with co-generation and export of power to grid	*16*
(Source: Tamil Nadu Cooperative Sugar Federation Limited (TCSFL), GoTN)	

As on January 2005 only five sugar mills in India from total of around 427 sugar mills, are operating with grid connected cogeneration unit of high pressure configuration of 86 kg/cm^2 (equivalent configuration as of the project activity). This shows a very low penetration of technology (less than 1% in India and 2.7% in Tamil Nadu). The project activity is not a common practice and occurs in less than 20 % of the similar cases, which determines that the project activity is additional.

Step 5: Impact of CDM registration

EID Parry has implemented the project activity despite the various risks (described in step 3) associated with the project activity; Technical problems related to the plant operation, bagasse availability etc may result in untimely shut downs of plant and its associated loss of production. In fact, the bagasse availability for 2006-07, the first year of project operation, is expected to be only 70% of the rated capacity. Moreover, negative changes in purchase tariff or SERC's policy on co-generation to limit the plant load factor to low levels etc are significant risks. The realisation of any of these risks would impact the optimal operation of the co-generation plant and result in huge financial losses. The CDM Registration will certainly improve the financial sustainability of the project activity by facilitating carbon revenues that would serve to overcome the project risks by offsetting part of the financial losses. Moreover, its financial viability would encourage FIs to readily fund similar ventures by other promoters.

The successful operation of the project plant would demonstrate the viability of high efficiency grid connected power generation and encourage similar initiatives in other sugar industries in the country resulting in a significant quantum of anthropogenic greenhouse gas emissions reductions.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The emission reductions are mainly from the incremental energy generation using the same quantity of biomass that would been combusted in the baseline scenario (low pressure cogeneration plant). The incremental energy is exported to the grid and displaces equivalent CO_2 emission from grid connected power plants.

<u>Project Emissions:</u>

With reference to ACM0006, it is required to account CO_2 emissions from the combustion of fossil fuels used by the project activity (during unavailability of bagasse / drought / any other unforeseen circumstances) and that used for transportation of biomass from other sites to the project activity. Such emissions are calculated by using the below equations:

Carbon dioxide emissions from transportation of biomass to the project site (*PETy*):

$$PET_y = \frac{\sum BF_{i,y}}{TL_y} \times AVD_y \times EF_{Km,CO_2}$$

Where:

BFi,y is the quantity of biomass type i, transported from other sites and used as fuel in the project plant during the year *y* in a volume or mass unit,

TLy is the average truck load of the trucks used measured in tons of biomass,

AVDy is the average return trip distance between the biomass fuel supply sites and the site of the project plant in kilometers (km), and

EF_{Km,CO_2} is the average CO_2 emission factor for the trucks measured in tCO_2/km

Carbon dioxide emissions from on-site consumption of fossil fuels (*PEFFy*):

$$PEFF_y = \sum FF_{projectplant,i,y} \; x \; COEF_{co_2,i}$$

where,

$PEFF_y$ is the project emission from fossil fuel co-firing during the year y in tons of CO_2,

$FF_{projectplanti,y}$ is the quantity of fuel type i combusted due to the project activity during the year y in a volume or mass unit,

$COEF_{CO2,i}$ *i*s the CO_2 emission factor of the fossil fuel type ‘i’ calculated as:

$COEF_{CO2,i}$ $= 96.1 \; x \; 0.98 \; x \; NCV_i$

Where, 96.1 is the IPCC default emission factor for coal in tCO_2/TJ, 0.98 is the oxidation factor and NCV_i is the calorific value of the fossil fuel.

Baseline Emissions:

ACM0006 refers to calculation of baseline emission factor using ACM0002 (“Consolidated baseline methodology for grid connected electricity generation from renewable energy sources”) estimated as under:

Baseline emissions due to displacement of electricity

For the displacement of electricity, the baseline scenario is the electricity that would have been generated by the operation of grid-connected power plants and by the addition of new generation sources, in the absence of the project activity.

Calculation of electricity baseline emission factor

As the power generation capacity of the biomass power plant is more than 15 MW, $EF_{electricity,y}$ should be calculated as a combined margin (CM), following the guidance in the section “Baselines” in the “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” (ACM0002).

STEP 1. Calculate the Operating Margin emission factor(s) ($EF_{OM,y}$) – Out of four methods mentioned in the ACM0002, Simple OM approach has been chosen for calculations since in the southern regional grid mix, the low-cost/must run resources constitute less than 50% of total grid generation. Simple OM factor is calculated as under.

$$EF_{OM,Simple,y} = \sum_{i,j} F_{i,j,y} \, x \, COEF_{i,j} / \sum_{j} GEN_{j,y}$$

where,

Fi ,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 from the grid

COEFi,j y - Is the CO_2 emission coefficient of fuel *i* (tCO_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

GENj,y - Is the electricity (MWh) delivered to the grid by source *j*

The CO_2 emission coefficient *COEFi* is obtained as

$$COEF_i = NCV_{i,}\ x\ EF_{CO2} xOXIDi$$

For calculations, local values of *NCVi* and $EFCO_{2i}$ have been used and a 3-year average based on the most recent statistics available at the time of PDD submission has been used for grid power generation data.

STEP 2. Calculate the Build Margin emission factor ($EF_{BM,y}$) as the generation-weighted average emission factor (tCO_2/MWh) of a sample of power plants *m* of southern regional grid, as follows:

$$EF_{BM,y} = \sum_{i,m} F_{i,m,y}\ x\ COEF_{i,m} / \sum_{j} GEN_{m,y}$$

where,

Fi,m,y, *COEFi,m* and *GENm,y* - Are analogous to the variables described for the simple OM method above for plants *m*.

Considered calculations for the Build Margin emission factor $EF_{BM,y}$ are *ex ante* based on the most recent information available on plants already built for sample group *m* of southern regional grid at the time of PDD submission. The sample group *m* consists 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.

Further, power plant capacity additions registered as CDM project activities have been excluded from the sample group *m* of southern regional grid mix.

STEP 3. Calculate the electricity baseline emission factor *EFelectricity,y* as the weighted average of the Operating Margin emission factor (*EFOM,y*) and the Build Margin emission factor (*EFBM,y*):

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

Where, the weights w_{OM} and w_{BM}, by default, are 50% (i.e., $w_{OM} = w_{BM} = 0.5$)

Determination of EG_y:

Where scenario 14 applies, *EGy* is determined based on the net efficiency of electricity generation in the project plant prior to project implementation $\varepsilon_{el,pre\ project}$ and the net efficiency of electricity generation in the project plant after project implementation $\varepsilon_{el,project\ plant,y}$, as follows:

$$EG_y = EG_{projectplant,y} \times \left(1 - \frac{\in_{el,preproject}}{\in_{el,project\ plant,y}}\right)$$

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,
$EG_{project\ plant,y}$	- is the net quantity of electricity generated in the project plant during the year *y* in MWh,
$\varepsilon_{el,pre\ project}$	- is the net efficiency of electricity generation in the project plant prior to project implementation, expressed in MWhel/MWhbiomass
$\varepsilon_{el,project\ plant,y}$	-is average net energy efficiency of electricity generation in the project plant, expressed in MWhel/MWhbiomass.

Leakage:

ACM0006 states "The main potential source of leakage for this project activity is an increase in emissions from fossil fuel combustion due to diversion of biomass from other uses to the project plant as a result of the project activity. Where the most likely baseline scenario is the use of the biomass for energy generation (scenarios 1, 4, 6, 8, 9, 11, 12, 13 and 14), the diversion of biomass to the project activity is already considered in the calculation of baseline reductions. In this case, leakage effects do not need to be addressed." The project activity falls under scenario 14 of ACM0006 and therefore does not require addressing leakage. There is no leakage of emission reductions.

Emission Reductions:

The emission reductions from the project activity are primarily the reduction in CO_2 emissions associated with grid power generation achieved through its substitution with biomass based power generation. The emission reduction *ERy* by the project activity during a given year *y* is the difference between the emission reductions from; the substitution of electricity generation with fossil fuels (*ERelectricity,y*), the emission reductions from the substitution of heat generation with fossil fuels (*ERheat,y*); and project emissions (*PEy*), emissions due to leakage (*Ly*), as follows:

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

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

where,

ER_y - Are the net emissions 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 displacement of electricity during the year y in tons of CO_2

PE_y - Are the project emissions during the year y in tons of CO_2

L_y - Are the leakage of emission reductions during the year y in tons of CO_2

In this case (Scenario 14), $ER_{heat,y}$ and L_y are zero.

The project proponents does not claim emission reductions for displacement of heat since heat generation prior to the project activity was also generated using bagasse as fuel. Emission reductions from avoidance of emissions due to natural decay or uncontrolled burning do not apply to scenario 14.

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

Data / Parameter:	**$EG_{pre-project,y}$**
Data unit:	MWh
Description:	Electricity generation in the 4.5 MW low pressure system (pre-project scenario)
Source of data used:	EID Parry
Value applied:	14052.60
Justification of the choice of data or description of measurement methods and procedures actually applied :	Measured using calibrated energy meters for the year 2005
Any comment:	This data is used for calculation of pre-project energy efficiency

Data / Parameter:	$BF_{pre-project,y}$
Data unit:	Tonnes
Description:	Quantity of biomass input to the 4.5 MW low pressure cogeneration plant prior to the project activity
Source of data used:	EID Parry
Value applied:	143075.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	Monthly and annual mass and energy balance in the sugar plant supported by RT 8C forms submitted to the Government of India
Any comment:	This data is used for calculation of pre-project energy efficiency

Data / Parameter:	$NCV_{BF,y}$
Data unit:	Kcal/kg
Description:	Net Calorific value of fuel (biomass) used in the pre-project scenario
Source of data used:	EID Parry
Value applied:	2250
Justification of the choice of data or description of measurement methods and procedures actually applied :	The NCV is determined in calibrated calorimeters of a certified agency
Any comment:	This data is used for calculation of pre-project energy efficiency

Data / Parameter:	$EF_{electricity}$
Data unit:	tCO_2/MWh
Description:	Combined margin baseline emission factor of the southern regional grid
Source of data used:	CEA/IPCC
Value applied:	0.9103
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated as per guidelines provided in ACM0002
Any comment:	More details in Annexure 3

B.6.3 Ex-ante calculation of emission reductions:

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The following tables show the calculation of emission reductions using the formula mentioned in section B.6.1.

Project emissions:

Emissions due to combustion of fossil fuels in the project activity:				
S.No	**Notation**	**Parameter**	**Unit**	**Value**
1	FFproject plant,$_y$	Quantity of coal used	T/yr	0
2	NCV	Calorific Value	TJ/T coal	0.020784
3	EF_{CO2}	CO2 emission factor	tCO_2/TJ	96.1
4	OXID	Oxidation factor		0.98
5	COEF (2*3*5)	CO2 emission factor	tCO_2/T coal	1.957421
6	$PEFF_y$ (1*5)	CO2 emissions from coal	tCO_2/yr	0

Emissions due to combustion of fossil fuels for transportation of biomass:				
7	BF_y	Quantity of biomass bought and transported from outside	T	40,800
8	TL_y	Average truck load of the trucks used	T	10
9	AVD_y	Average return trip distance between the biomass fuel supply sites and the project plant	kms	100
10		Fuel consumption per 1000 kilometer	kg/000'kms	205
11		CO2 emission factor	kgCO2/kg fuel	3.16
12	$EF_{km,CO2}$ (10*11)	Average CO2 emission factor of the trucks	kgCO2/km	0.6478
13	PET_y ((7*9*12) / (8))	CO2 emissions from diesel	tCO2	264.30
14	PE_y (6+13)	Total Project Emissions	tCO2	264.30

Leakage:

For scenario 14, leakage is already considered in the baseline calculations and need not be separately addressed.

Baseline emissions:

Determination of EGy:

S.No	Notation	Parameter	Unit	Pre-project	Post project
1	EGpre-project,y	Generation from the pre-project 4.5 MW, 17 Kg/cm2 system in year 2005	MWhe	14,052.60	0.00
2	EGproject plant,y	Generation from the 18 MW, 87 Kg/cm2 system	MWhe	-	131,900
3	BFpre-project,y	Fuel Consumption (Old 4.5 MW system)	T	143,075.83	0.00
4	BFpre-project,y	Fuel Consumption in heat equivalent	MWh	384,319.07	0.00
5	BFproject plant,y	Fuel Consumption (New 18 MW system)	T	-	311,680
6	BFproject plant,y	Fuel Consumption in heat equivalent	MWh	-	826,503
7	$\varepsilon_{el,\ pre\text{-}project}$ (1/4)	Pre-project efficiency	-	0.0365651	
8	$\varepsilon_{el,\ project\ plant,y}$ (2/6)	Project plant efficiency	-	-	0.1596
9	EGy (2* (1- (7/8)))	Incremental Energy generation from the project activity	MWh	-	101,679

S.No	Notation	Parameter	Unit	Value
10	EG_y	Incremental Energy generation from the project activity	MWhe/yr	101,679
11	$EF_{electricity}$	Baseline emission factor for grid	tCO_2/MWh	0.9103
12	BE_y (10*11)	Baseline emissions	tCO_2/yr	92,559

Emission reductions

S.No	Notation	Parameter	Unit	Value
1	BE_y	Baseline emissions	tCO_2/yr	92,559
2	PE_y	Project emissions	tCO_2/yr	264
3	L_y	Leakage	tCO_2/yr	0
3	ER_y (1-2-3)	Emission reductions	tCO_2/yr	92,295

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

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Sr. No.	Operating Years	Baseline Emission Factor (tonnes of CO_2 / MWh) EFy	Incremental electricity generation (MWh) EGy	Baseline Emissions (tonnes of CO_2) BEy	Project Emissions (tonnes of CO_2) PEy	Certified Emission Reductions - CERs (tonnes of CO_2)
1.	2007	0.9103	101,678	92,559	264	92,295
2.	2008	0.9103	101,678	92,559	264	92,295
3.	2009	0.9103	101,678	92,559	264	92,295
4.	2010	0.9103	101,678	92,559	264	92,295
5.	2011	0.9103	101,678	92,559	264	92,295
6.	2012	0.9103	101,678	92,559	264	92,295
7.	2013	0.9103	101,678	92,559	264	92,295
8.	2014	0.9103	101,678	92,559	264	92,295
9.	2015	0.9103	101,678	92,559	264	92,295
10.	2016	0.9103	101,678	92,559	264	92,295
	2007-2016		**1,016,780**	**925,590**	0	**922,950**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**AVD_y**
Data unit:	Kilometres (Kms)
Description:	Average return trip distance between biomass fuel supply sites and the project site
Source of data to be used:	Truck operator
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100
Description of measurement methods and procedures to be applied:	The truck operator will provide the distance travelled by the truck between the fuel supply site
QA/QC procedures to be applied:	Consistency of distance records provided by the truckers will be checked by comparing recorded distances with information from other sources
Any comment:	This data is used to calculate project emissions from biomass transportation

Data / Parameter:	**TL_y**
Data unit:	Tonnes
Description:	Average truck load of the trucks used for transportation of biomass
Source of data to be used:	EID Parry
Value of data applied for the purpose of calculating expected emission reductions in section B.5	10
Description of measurement methods and procedures to be applied:	Average carrying capacity of trucks
QA/QC procedures to be applied:	Weigh bridges used for measuring the truck loads will be calibrated periodically
Any comment:	This data is used to calculate project emissions from biomass transportation

Data / Parameter:	**$EF_{km, CO2}$**
Data unit:	t CO_2/km
Description:	Average CO_2 emission factor for transportation of biomass with trucks
Source of data to be used:	IPCC and Truck operator
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.6478
Description of measurement methods and procedures to be applied:	Declaration from the truck operators
QA/QC procedures to be applied:	Check consistency of measurements and local / national data with default values by the IPCC. If the values differ significantly from IPCC default values, possibly collect additional information or conduct measurements.
Any comment:	Local or national data will be used. Default values from the IPCC will be used alternatively and chosen in a conservative manner.

Data / Parameter:	**$FF_{project\ plant\ i,y}$**
Data unit:	Tonnes
Description:	Onsite fossil fuel consumption of type ‘i’ for co-firing in the project plant
Source of data to be used:	EID Parry

Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	The quantity of fossil fuel is measured at the weigh bridge before their unloading into the project site.
QA/QC procedures to be applied:	The consistency of metered fuel consumption quantities will be checked with purchase receipts
Any comment:	

Data / Parameter:	**$NCV_{i,FF}$**
Data unit:	Kcal/kg
Description:	Calorific value of fossil fuel
Source of data to be used:	EID Parry
Value of data applied for the purpose of calculating expected emission reductions in section B.5	4964
Description of measurement methods and procedures to be applied:	The NCV is determined in calibrated calorimeters of a certified agency
QA/QC procedures to be applied:	Check consistency of measurements and local / national data with default values by the IPCC. If the values differ significantly from IPCC default values, possibly collect additional information or conduct measurements.
Any comment:	

Data / Parameter:	**$COEF_{CO2,\,i}$**
Data unit:	tCO_2/t of fuel
Description:	CO_2 emission factor for fuel type i
Source of data to be used:	IPCC
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1.9574
Description of measurement methods and procedures to be applied:	Calculated using formula provided in ACM0006
QA/QC procedures to be applied:	Check consistency of measurements and local / national data with default values by the IPCC. If the values differ significantly from IPCC default values, possibly collect additional information or conduct measurements.

Any comment:	Local values / IPCC Guidelines/Good Practice

Data / Parameter:	**EG_y**
Data unit:	MWh
Description:	Net quantity of Electricity supplied to the grid by the project
Source of data to be used:	EID Parry/TNEB
Value of data applied for the purpose of calculating expected emission reductions in section B.5	101679
Description of measurement methods and procedures to be applied:	Calibrated energy meters of EID Parry and TNEB Frequency: Daily in EID Parry meters and monthly in TNEB meters
QA/QC procedures to be applied:	The consistency of metered net electricity generation will be cross-checked with receipts from sales (if available) and the quantity of biomass fired (e.g. check whether the electricity generation divided by the quantity of biomass fired results in a reasonable efficiency that is comparable to previous years)
Any comment:	Reference to ACM0002. Electricity supplied by the project activity to the grid. Double check by receipt of sales.

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:	EID Parry
Value of data applied for the purpose of calculating expected emission reductions in section B.5	131900
Description of measurement methods and procedures to be applied:	Calibrated energy meters of EID Parry Frequency: Daily in EID Parry meters
QA/QC procedures to be applied:	The consistency of metered net electricity generation will be cross-checked with receipts from sales (if available) and the quantity of biomass fired (e.g. check whether the electricity generation divided by the quantity of biomass fired results in a reasonable efficiency that is comparable to previous years)
Any comment:	

Data / Parameter:	**$BF_{i,y}$**
Data unit:	Tonnes
Description:	Quantity of biomass type *i* combusted in the project plant during year y
Source of data to be used:	EID Parry

Value of data applied for the purpose of calculating expected emission reductions in section B.5	311680
Description of measurement methods and procedures to be applied:	Monthly and annual mass and energy balance in the sugar plant supported by RT 8C forms submitted to the Government of India
QA/QC procedures to be applied:	Any direct measurements with mass or volume meters at the plant site will be cross-checked with annual energy balance that is based on fuel generated in-house, purchased quantities and stock exchanges
Any comment:	

Data / Parameter:	$\mathbf{NCV_{i,BF}}$
Data unit:	Kcal/kg
Description:	Net calorific value of biomass
Source of data to be used:	EID Parry
Value of data applied for the purpose of calculating expected emission reductions in section B.5	2250
Description of measurement methods and procedures to be applied:	The NCV is determined in calibrated calorimeters of a certified agency
QA/QC procedures to be applied:	Check consistency of measurements and local / national data with default values by the IPCC. If the values differ significantly from IPCC default values, possibly collect additional information or conduct measurements.
Any comment:	

Data / Parameter:	$\varepsilon_{el,project\ plant,y}$
Data unit:	MWh electricity per MWh heat input
Description:	Average net energy efficiency of electricity generation in the project plant
Source of data to be used:	EID Parry
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.1596
Description of measurement methods and procedures to be applied:	Calculated using formula provided in ACM0006 based on estimated electricity generation and fuel consumption
QA/QC procedures to	Check consistency with manufacturer's information or the efficiency of

be applied:	comparable plants.
Any comment:	

Data / Parameter:	ε_{boiler}
Data unit:	%
Description:	Average net energy efficiency of heat generation in the boiler that is operated next to the project plant
Source of data to be used:	EID Parry
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not Applicable. There is no boiler operated next to the project plant
Description of measurement methods and procedures to be applied:	Not Applicable
QA/QC procedures to be applied:	Check consistency with manufacturer's information or the efficiency of comparable plants.
Any comment:	

B.7.2 Description of the monitoring plan:

>>

EID Parry will incorporate a special team for implementing the monitoring procedures as described in sections B6.2 and B7.1. The team will comprise of relevant personnel from various departments, who will be assigned the task of monitoring and recording specific CDM parameters relevant to their department. The monitored values will be periodically cross-checked by the respective department heads and sent to the CDM team head for compilation and analysis. Any deviation of monitored values from estimated values will be investigated and appropriate action would be taken. The monitored values would be recorded and stored in paper and electronically for verification. Elaborate monitoring information is provided in Annexure 5.

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)

>>

September 2006

M/s. EID Parry India Limited

'DARE' House

234, NSC Bose Road

Chennai – 600 001

The entity is a project participant 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:

>>
December 2004

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

>>
25 years

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

>>
The project proponent wishes to adopt a fixed crediting period of ten years

C.2.1. Renewable crediting period

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:

C.2.2.1. Starting date:

>>
01 January 2007

C.2.2.2. Length:

>>
10 years

SECTION D. Environmental impacts

>>

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

>>

An Environmental Impact Assessment has been undertaken to investigate, analyse and mitigate the effects caused by the project activity on the surrounding environment. The project proponent being environmentally concerned and in view of running the project activity as a sustainable one, has taken all care to follow the rules and regulations for conservation of environment as prescribed by the licensing authorities (TNPCB). The Environmental Impact Assessment takes into consideration, the impacts associated with the project activity in the following phases of the project implementation:

- Construction Phase
- Operation and Maintenance Phase

All issues concerned to environs of the project activity have been identified and their possible impacts have given due consideration in the Environmental Management Plan. Assessment of environmental impacts due to the project activity has been carried out and a separate report is available as Enclosure – I

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 following documents have been prepared by EID Parry in accordance with the requirements of the host party (Government of India):

- Environmental clearance in the form of "Consent to operate" from the Tamil Nadu Pollution Control Board (TNPCB).
- Environmental Impact Assessment and Environmental Management Plans are to be prepared and submitted to the pollution control board.
- Consent for operation obtained from the Tamil Nadu (State) Pollution Control Board (TNPCB) under Section 21 of the Air (Prevention and Control of Pollution) Act, 1981 (Central Act 14 of 1981) as amended.
- Consent for operation obtained from TNPCB under Section 25/26 of the Water (Prevention and Control of Pollution) Act, 1974 (Central Act 6 of 1974) as amended.

These documents will be made available to the DOE during Validation.

SECTION E. Stakeholders' comments

>>

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

>>

EID Parry India Limited has commenced power export through the 18.55 MW biomass based cogeneration plant from their sugar factory premises starting March 2006. The major local stakeholders to the project activity are the local population comprising mainly of farmers, state pollution control board governing the region, off-taker of power and other parties involved in its construction, operation and supply of fuel. EID Parry decided to go ahead with the stakeholder consultation process via conducting a meeting (06.01.2006) and appraising the stakeholders about the project activity. The list of invited stakeholders includes:

- Elected body of representatives administering the local area (Village Panchayat)
- Non Governmental Organizations (NGO's) in the area
- Tamil Nadu Electricity Board (TNEB)
- Tamil Nadu Pollution Control Board (TNPCB)
- Equipment manufacturers / suppliers
- Project consultants

The stakeholder consultation was conducted at EID Parry's premises. EID Parry's CDM consultants appraised the stakeholders about the project activity, technology used, fuel used and its likely benefits. Clarifications raised on the impacts were addressed and the written responses from stakeholders were collected. The whole process has been recorded on video and a report of the meeting is available with the project proponent, which will be made available to the DOE.

E.2. Summary of the comments received:

>>

Elected body of representatives administering the local area:

The panchayat is the representative body of the local population surrounding the project activity.

The following table shows the possible impacts the project activity could have on local population and measures undertaken by EID Parry:

Possible impacts	Preventive measures

Increase in air/Water/Noise pollution resulting in degradation of health and local ecology	Appropriate Flue gas treatment systems, effluent treatment systems and noise reduction systems have been incorporated to ensure outlet noise/emissions are below safe levels.
Improvement in direct employment as operating and maintenance staff for the project activity resulting in lesser labour migration from rural areas	Positive impact
Improvement in the local grid power quality	Positive impact
High water consumption for cooling requirements resulting in groundwater depletion	Air-cooled condenser has been installed in place of water cooled condenser to prevent water depletion

Thus, the project activity doesn't have any negative impacts on the local population. The panchayat has commended the preventive measures adopted and welcomed the implementation of the project activity in their locality.

Tamil Nadu Pollution Control Board (TNPCB)

The TNPCB prescribes certain standards of environmental compliance for the stack emissions, stack height and discharge of effluent from the cogeneration plant. These are elaborated in Section 21 of the Air (Prevention and Control of Pollution) Act 1981 and Section 25/26 of the Water (Prevention and Control of Pollution) Act 1974 (Central Act 6 of 1974). EID Parry has installed required treatment systems to comply with these norms. The TNPCB has verified these systems and issued consent for operating the plant.

Tamil Nadu Electricity Board (TNEB)

As a buyer of the power, the TNEB is a major stakeholder in the project activity. They hold the key to the commercial success of the project activity. TNEB has agreed to purchase power from the project activity under the Non-conventional sources category and signed Power Purchase Agreement (PPA) with EID Parry. The two parties have also signed an agreement for parallel operation and supply / purchase of surplus power from EID Parry, Pudukkottai on 24th April 2005. The potential threat for TNEB is the disturbance from parallel operation leading to physical and operational damage of the grid. However, EID Parry has installed the required isolation and safety equipment to prevent such disturbances. TNEB will draw power and therefore pay under the Section 43 of the Electricity (Supply) Act, 1948. TNEB has commended the project as a renewable source of power that helps it to reduce the demand – supply gap in the state.

Project Consultants

The various activities of the project from concept to commissioning like the preparation of Detailed Project Report (DPR), preparation of basic and detailed engineering documents, preparation of tender documents, selection of vendors / suppliers, supervision of project implementation, Successful commissioning and trial runs involve the participation of project consultants and hence comments have been received from them.

Equipment suppliers

The equipment vendors and suppliers involved in the erection & commissioning of the project activity are aware of the potential risks involved in operating the project activity. They have provided their comments on impacts of the project activity.

The stakeholders have recognized the efforts taken by EID Parry towards environmentally and socio-economically sustainable operation of the project activity and have mentioned their appreciation for the project activity in the responses.

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

>>

All the stakeholders who attended the stakeholder meeting have provided positive response to the local and global effects of implementing the project activity. Since no negative comments were received, the project proponents are not required to take any corrective action. The promoters intend to operate the project activity in a sustainable and environmentally friendly way as possible so that there is no negative impact on the local stakeholders from the project activity during its lifetime. Further, the PDD will be made available in the validating DOE's website for public comments, which will be addressed appropriately.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	EID Parry India Limited
Street/P.O.Box:	234, NSC Bose Road
Building:	DARE House
City:	Chennai
State/Region:	Tamil Nadu
Postfix/ZIP:	600 001
Country:	India
Telephone:	+91 44 25306789
FAX:	+91 44 25340986
E-Mail:	radhakrishnankn@parry.murugappa.com
URL:	www.eidparry.com
Represented by:	
Title:	General Manager – Commercial
Salutation:	Mr
Last Name:	K.N.
Middle Name:	
First Name:	Radhakrishnan
Department:	
Mobile:	+91-98400-85880
Direct FAX:	
Direct tel:	+91 44 25340251
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding available for the project activity.

Annex 3

BASELINE INFORMATION

	2001-02		2002-03		2003-04	
Sector	**MU**	**%**	**MU**	**%**	**MU**	**%**
Thermal Based	84031.63	62.95	92053.19	67.03	95898	67.15
Gas Based	10329.45	7.74	13950.1	10.16	16949	11.87
Diesel Based	4135.12	3.10	4358.5	3.17	3225	2.26
Hydro-State	26260.42	19.67	18286.79	13.32	16630	11.64
Nuclear Based	5243.83	3.93	4390	3.20	4700	3.29
IPP-Co-Generation+BIOMASS	2023.82	1.52	2676.32	1.95	1910	1.34
IPP-Wind	1456.09	1.09	1606.81	1.17	3500	2.45
Total	**133480.4**	**100.00**	**137321.7**	**100.00**	**142812.0**	**100.00**
Total generation excluding Low-cost power generation	98496.20	73.79	110361.79	80.37	116072.00	81.28
Generation by Coal and Lignite out of Total Generation excluding Low-cost power generation	84031.63	62.95	92053.19	67.03	95898.00	67.15
Generation by Gas out of Total Generation excluding Low-cost power generation	10329.45	7.74	13950.10	10.16	16949.00	11.87
Generation by Diesel out of Total Generation excluding Low-cost power generation	4135.12	3.10	4358.50	3.17	3225.00	2.26
Estimation of Baseline Emission Factor (tCO_2/MU)						
Simple Operating Margin						
Fuel 1 : Coal (Steam Stations)						
Avg. Calorific Value of Coal used (kcal/kg)		4845.0		4171.0		3820.0
Coal consumption (tons/yr)		53107000		65997000		52985000
Emission Factor for Coal-IPCC standard value (tonne CO2/TJ)		96.1		96.1		96.1
Oxidation Factor of Coal-IPCC standard value		0.98		0.98		0.98
COEF of Coal (tonneCO2/ton of coal)		1.91		1.64		1.51
Emissions per year (tCO2)		101460728.10		108546745.94		79812097.76
Fuel 2 : Furnace Oil (Steam Stations)						

Avg. Calorific Value of fuel used (kCal/kg)		10497		10726		10365
Fuel consumption (tons/yr)		115103.7		103163.46		50275.21
Emission Factor for Fuel- IPCC standard value(tonne CO2/TJ)		73.33		73.33		73.33
Oxidation Factor of Fuel-IPCC standard value		0.99		0.99		0.99
COEF of Gas(tonneCO2/ton of Oil)		3.19		3.26		3.15
Emissions per year (tCO2)		367270.60		336353.06		158399.89
Fuel 3 : Diesel Oil (Steam Stations)						
Avg. Calorific Value of fuel used (kCal/kg)		10293		9760		10186
Fuel consumption (tons/yr)		5821.65		7145.95		28076.35
Emission Factor for Fuel- IPCC standard value(tonne CO2/TJ)		74.07		74.07		74.07
Oxidation Factor of Fuel-IPCC standard value		0.99		0.99		0.99
COEF of Fuel(tonneCO2/ton of fuel)		3.16		3.00		3.13
Emissions per year (tCO2)		18397.05		21412.63		87802.02
Fuel 4 : LSHS (Steam Stations)						
Avg. Calorific Value of fuel used (kCal/kg)		10457		10524		10302
Fuel consumption (tons/yr)		7321.6		5361.84		4672.8
Emission Factor for Fuel- IPCC standard value(tonne CO2/TJ)		73.33		73.33		73.33
Oxidation Factor of Fuel-IPCC standard value		0.99		0.99		0.99
COEF of Fuel(tonneCO2/ton of gas)		3.18		3.20		3.13
Emissions per year (tCO2)		23272.59		17152.46		14632.90
Fuel 5 : Gas (Steam Stations)						
Avg. Calorific Value of Gas used (kCal/M3)		NA		NA		2000
Gas consumption (M3/yr)		0.00		0		1932274000.00
Emission Factor for Gas- IPCC standard value(tonne CO2/TJ)		56.10		56.10		56.10
Oxidation Factor of Gas-IPCC standard value		0.995		0.995		0.995
COEF of Gas(kgCO2/M3 of gas)		NA		NA		0.47
Emissions per year (tCO2)		0.00		0.00		903206.01

Fuel 6 : Naphtha (Gas Stations)						
Avg. Calorific Value of Fuel used (TJ/kt)		45.01		45.01		45.01
Fuel consumption (tons/yr)		149197.41		322854.84		478596.51
Emission Factor for Fuel- IPCC standard value(tonne CO2/TJ)		73.33		73.33		73.33
Oxidation Factor of Fuel-IPCC standard value		0.995		0.995		0.995
COEF of Fuel(tonneCO2/ton of Fuel)		3.284		3.284		3.284
Emissions per year (tCO2)		489997.65		1060327.52		1571818.00
Fuel 7 : HSD (Gas Stations)						
Avg. Calorific Value of Fuel used (kCal/kg)		10293		9760		10186
Fuel consumption (tons/yr)		4614.65		233853.7		192933.85
Emission Factor for Fuel- IPCC standard value(tonne CO2/TJ)		74.07		74.07		74.07
Oxidation Factor of Fuel-IPCC standard value		0.99		0.99		0.99
COEF of fuel(tonneCO2/ton of Fuel)		3.160		2.996		3.127
Emissions per year (tCO2)		14582.80		700735.68		603354.10
Fuel 8 : Natural Gas (Gas Stations)						
Avg. Calorific Value of Gas used (TJ/Million M3)		37.98		37.98		37.98
Estimated Gas consumption (Million M3/yr)		3230		3130		2010
Emission Factor for Gas- IPCC standard value(tonne CO2/TJ)		56.10		56.10		56.10
Oxidation Factor of Gas-IPCC standard value		0.995		0.995		0.995
COEF of Gas(tonneCO2/Million M3 of gas)		2120.024		2120.024		2120.024
Emissions per year (tCO2)		6847678.25		6635675.82		4261248.69
Fuel 9 : Diesel (Diesel Stations)						
Avg. Calorific Value of Fuel used (kCal/kg)		10293		9760		10186
Diesel consumption (tons/yr)		648561.05		736047.3		12667.55
Emission Factor for Diesel-IPCC standard value (tonne CO2/TJ)		74.07		74.07		74.07
Oxidation Factor of Diesel-IPCC standard value		0.99		0.99		0.99
COEF of Diesel (tonneCO2/ton of diesel)		3.16		3.00		3.13
Emissions per year (tCO2)		2049523.97		2205543.90		39614.71

Fuel 10 : LSHS (Diesel Stations)						
Avg. Calorific Value of Fuel used (kCal/kg)		10457		10524		10302
Fuel consumption (tons/yr)		0		0		569756.88
Emission Factor for Fuel-IPCC standard value (tonne CO2/TJ)		73.33		73.33		73.33
Oxidation Factor of Fuel-IPCC standard value		0.99		0.99		0.99
COEF of Fuel (tonneCO2/ton of Fuel)		3.18		3.20		3.13
Emissions per year (tCO2)		0.00		0.00		1784197.02
Fuel 11 : Lignite						
Avg. Efficiency of power generation with lignite as a fuel, %		30		30		30
Avg. Calorific Value of Lignite used (kCal/kg)		2625		2686		2737
Estimated lignite consumption (tons/yr)		17318250		17738000		20755000
Emission Factor for Lignite-IPCC standard value (tonne CO2/TJ)		101.18		101.18		101.18
Oxidation Factor of Lignite-IPCC standard value		0.98		0.98		0.98
COEF of Lignite (tonneCO2/ton of lignite)		1.09		1.12		1.14
Emissions per year (tCO2)		18873997.43		19780680.95		23584578.25
EF (OM Simple, excluding imports from other grids), tCO2/MU		1321.32		1262.25		971.99
EF (OM Simple), tCO2/MU		**1321.32**		**1262.25**		**971.99**
Average EF (OM Simple), tCO2/MU						**1185.19**
Considering 20% of Gross Generation						
Sector						
Thermal Coal Based-State					1554.00	5.15
Thermal Coal Based-Central					7296.00	24.20
IPP-Coal Based					0	0.00
Lignite based power plant					4668	15.48
IPP-Gas (Naphtha) Based					8520	28.26
IPP-Diesel Based					422.32	1.40
Hydro-State					2200.70	7.30
Nuclear Based-Central					0.00	0.00
IPP-Co-Generation + biomass					3493.40	11.59
IPP-Wind					2000	6.63

Total						**30154**	**100.00**
Generation by Coal out of Total Generation						8850.00	29.35
Generation by Gas out of Total Generation						8520.06	28.26
Generation by Diesel out of Total Generation						422.32	1.40
Generation by lignite out of Total Generation						4668	15.48
Built Margin	-	-					
Fuel 1 : Coal							
Avg. efficiency of power generation with coal as a fuel, %							31.9
Avg. calorific value of coal used, kcal/kg							4153.8
Estimated coal consumption, tons/yr							5752500.0
Emission factor for Coal (IPCC),tonne CO2/TJ							96.1
Oxidation factor of coal (IPCC standard value)							0.98
COEF of coal (tonneCO2/ton of coal)							1.638
Fuel 2 : Gas							
Avg. Efficiency of power generation with gas as a fuel, %							45
Avg. Calorific Value of Gas used (TJ/Million M3)							37.98
Estimated Gas consumption (Million M3/yr)							1794.64
Emission Factor for Gas- IPCC standard value(tonne CO2/TJ)							56.10
Oxidation Factor of Gas-IPCC standard value							0.995
COEF of Gas(tonneCO2/Million M3 of gas)							2120.024
Fuel 3 : Diesel							
Avg. efficiency of power generation with diesel as a fuel, %							41.7
Avg. calorific value of diesel used, kcal/kg							10348
Estimated diesel consumption, tons/yr							84168.1
Emission factor for Diesel (as per standard IPCC value)							74.07
Oxidation factor of Diesel (IPCC standard value)							0.99
COEF of diesel tonneCO2/ton of diesel							3.18
Fuel 4 : Lignite							
Avg. efficiency of power generation with lignite as a fuel, %							29
Avg. calorific value of lignite used, kcal/kg							2683
Estimated lignite consumption, tons/yr							5087771
Emission factor for lignite (as per standard IPCC value)							101.18
Oxidation factor of lignite (IPCC standard value)							0.98

COEF of lignite tonneCO2/ton of lignite						1.11
EF (BM , excluding imports) (tCO2/MU)						635.44
EF (BM), tCO2/MU						**635.4**
Combined Margin Factor (Avg of OM & BM)						**910.3**
Baseline Emissions Factor (tCO2/MU)						**910.3**

Annex 4

MONITORING INFORMATION

EID Parry has employed the latest and state of the art monitoring system and equipment to measure, record and report the various key CDM parameters. Monitoring methods have been designed and implemented for all parameters in Sections B.6.2 and B.7.1 required to calculate emission reductions, project emissions and leakage.

Power generation and export: The quantity of energy generated and exported is the main parameter for calculating emission reductions. The gross energy generated, captive consumption and energy exported are monitored by energy meters and recorded both manually and by the DCS. These figures will be cross-checked with TNEB invoices that indicate the net energy supplied to the grid. Moreover, the quantity of steam generation is also monitored and recorded.

Bagasse and other fuels: The quantity of bagasse generated is monitored based on the cane crushed. Periodic sampling is done for testing and monitoring the calorific value. Annual bagasse balance will be done to verify the figures. Purchase of outside biomass and coal for co-firing during bagasse shortages will be measured at the weigh bridge during entry into the premises. The values will be cross checked with purchase invoices. The calorific values of purchased fuels will also be monitored in the laboratory.

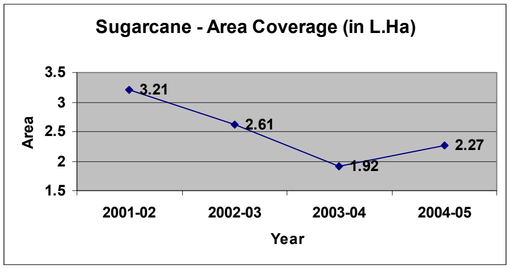
Energy Efficiency: The total quantity and heat content of fuels fired will be consolidated on a periodic basis and correlated with the steam and energy generation in the same period to calculate the energy efficiency of the boiler, overall electrical efficiency, specific steam consumption etc.

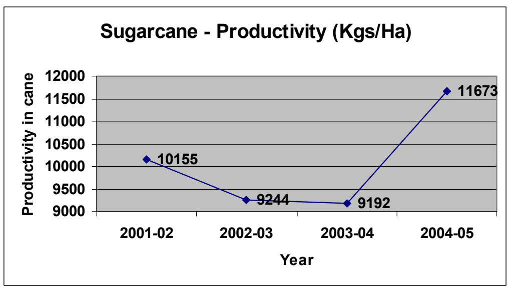
Biomass Transportation: The vehicles used for transportation of outside biomass will be monitored and the details including vehicle registration number, quantity of biomass transported every trip, number of trips, odometer readings prior to and after the trip and fuel consumption of the truck will be recorded in log books and consolidated in electronic format. The average mileage will be calculated from correlating the total distance traveled in a period and the total fuel consumed.

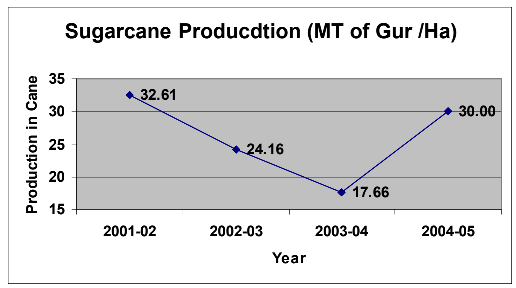
All the instruments and equipments used for metering will be calibrated by an authorized third party on a periodic basis to ensure accuracy of measurements. EID Parry will follow its internally accepted standards and norms of in monitoring all the above parameters. The records will be available for scrutiny during Validation and Verification.

Annex 5

Sugarcane cultivation and production in Tamilnadu and India

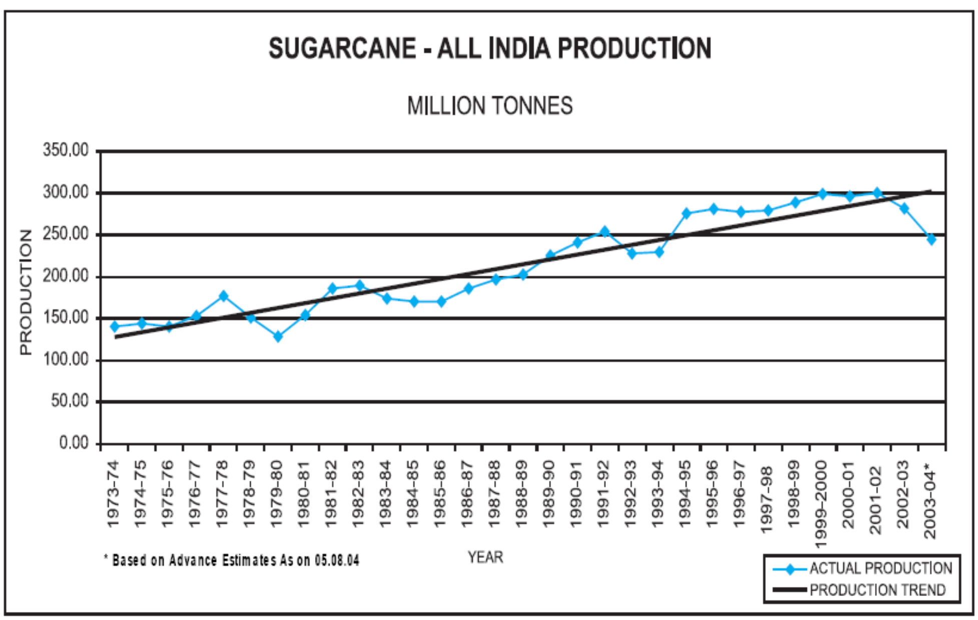






For Tamilnadu, Source: www.agricoop.nic.in/RabiCampaing05_06/ RabiCamp05_06/Tamil%20Nadu.ppt

98



Source: Reports of The Commission For Agricultural Costs and Prices During 1999-2000 – www.agricoop.nic.in

Appendix A

Abbreviations

CC	Climate Change
CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CER	Certified Emission Reductions
CMIE	Centre for Monitoring Indian Economy
CO	Carbon mono-oxide
CO_2	Carbon di-oxide
CPU	Central Power Units
DCS	Distributed Control System
DPR	Detailed Project Report
DM	De-Mineralised
EGEAS	Electric Generation Expansion Analysis System
EPS	Electric Power Survey
ESP	Electro Static Precipitator
EIA	Environmental Impact Assessment
FD	Forced Draft
FYP	Five Year Plan
GHG	Greenhouse Gas
GOI	Government of India
GWh	Gega Watt hour
HP	High Pressure
HV	High Voltage
ID	Induced Draft
IPCC	Intra-governmental Panel for Climate Change
IPP	Independent Power Producers
IREDA	Indian Renewable Energy Development Agency
ISPLAN	Integrated System Plan
KP	Kyoto Protocol
Km	Kilo meters

KV	Kilo Voltage
KW	Kilo Watt
KWh	Kilo Watt hour
NCES	Non-Conventional Energy Sources
LP	Low Pressure
1 Lakh	1,00,000
MkWh	Million Kilo Watt hour
MU	Million units
MNES	Ministry of Non-conventional Energy Sources
MoP	Ministry of Power
MoU	Memorandum of Understanding
MSW	Municipal Solid Waste
MT	Metric Ton
MW	Mega Watt
NCE	Non Conventional Energy
NEDA	Non conventional Energy Development Agency
Nox	Nitrogen Oxides
NTPC	National Thermal Power Corporation
p.a	Per annum
PLF	Plant Load Factor
PPA	Power Purchase Agreement
PIN	Project Idea Note
PRDS	Pressure regulating and de-superheating station
REP	Renewable Energy Projects
SA	Secondary Air
SEB	State Electricity Board
SO_2	Sulphur Di-oxide
SPM	Solid Particulate Matter
STG	Steam Turbine Generator
TCD	Tones of Crushing per Day
TDS	Total Dissolved Solids

TERI	Tata Energy Research Institute
TJ	Trillion Joules
TNEB	Tamilnadu Electricity Board
TNPCB	Tamilnadu Pollution Control Board
TPH	Tones Per Hour
UNFCCC	United Nations Framework Convention on Climate Change

Appendix B

Reference List

Sr.No	Particulars of the references
	Kyoto protocol / UNFCCC Related
1.	Kyoto Protocol to the United Nations Framework Convention on Climate Change
2.	Website of United Nations Framework Convention on Climate Change (UNFCCC), http://unfccc.int
3.	UNFCCC Decision 17/CP.7: Modalities and procedures for a clean development mechanism as defined in article 12 of the Kyoto Protocol.
	Project Related
4.	Detailed Project Report on 18.55 MW Non-Conventional renewable sources bagasse Cogeneration Power Plant at EID Parry, Pudukkottai
5.	Various project related information / documents / data received from EID Parry.
	Baseline Related
6.	CMIE published document of April 2002 on Energy, which includes the detailed data of Energy sector of India.
7.	Website of Center for Monitoring Indian Economy (CMIE) Pvt. Ltd., Mumbai, India – www.cmie.com
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Enclosure I

Summary of Environmental Impact Assessment

The environmental impacts are either categorized as primary or secondary impacts. Primary impacts are those that can be attributed directly by the project itself while secondary impacts are those, which are induced indirectly and typically include the associated investment and changed patterns of social and economic activities by the project activity.

The impact of the project on the environment can occur at two stages:

3. Construction phase (short term)
4. Operational phase (long term)

Various impacts during the construction and operation phase on the environmental parameters have been studied and the impact of the project activity during each phase is described as under.

Impacts during construction phase

The impacts during construction phase of the 18.55 MW biomass based cogeneration plant are listed as given here:

Air quality impacts:

- Due to dust arising out of leveling, grading, earthworks, foundation works
- Due to vehicular emissions from transportation of raw materials such as cement, sand, gravel etc
- Due to particulate emissions from construction activities such as pre-casting, fabrication, welding etc

Noise level increase:

- From construction activities
- Noise generated by earthmovers, Materials handling and Impact based equipment

Land use and soil quality:

- Change in land use pattern
- Rehabilitation and resettlement are not involved

Water environment impacts

- From consumption of water for construction purposes

Impacts on Terrestrial ecology

- Removal of vegetation at the site
- Impact on Aquatic ecology

- There are no major water bodies in the immediate vicinity of the plant

Impacts on Demography and Socioeconomics

- Employment opportunities to local people

All the above points discussed represent a broad range of environmental impacts during the construction phase of the cogeneration plant. It should be noted that the impacts due to construction activities are mostly short-term and will cease to exist beyond the construction phase.

Impacts during operational phase

The impacts during operational phase of the cogeneration plant are as given here:

Air quality impacts:

Negligible quantities of oxides of sulphur are present in the flue gas discharged by the cogeneration plant. The temperature encountered during burning of bagasse is not enough to produce nitrous oxide emissions, whereas Suspended Particulate Matter (SPM) from fly ash in the flue gas is inevitable.

Noise level increase:

Noise emission arises from the operation of turbine, boiler, compressors, motors and associated equipments in the cogeneration plant.

Water quality impacts:

The effluents generated from the project activity will be treated in the effluent treatment plant to ensure that there is no environmental deterioration. Wastewater treatment plant has been provided for the adequate treatment of the cogeneration plant effluents. The wastewater is treated to make it usable for irrigation purposes.

Water required of the project plant is met by the water sources available at the project site. Hence impact on ground water will not be significant.

Ecological impacts:

No ecological impacts are envisaged as the wastewater from the cogeneration plant is treated appropriately before final disposal. Also as trees have been planted around the site of the project activity, it cools the atmosphere in the operational area and mitigates air pollution and noise level increase.

Land and soil impacts:

Construction of cogeneration plant and roads will change the natural characteristics of the surface. Addition of impervious surface could add to marginal increase in runoff, which in turn could lead to soil erosion in case that soil is improperly vegetated.

Impact on Topography and Climate

The major envisaged topographical changes would be due to the manmade civil structures, which are negligible. Impact on climatic conditions will not be significant.

Demographic and Socio-economic impacts:

The cogeneration plant has contributed to socio economic growth in the following ways;

- Generation of employment opportunities
- Reduces migration of local work force to other areas
-

Summary of Environmental Management Plan (EMP)

The EMP is prepared to basically mitigate the various impacts arising from construction and operational phases of the cogeneration power plant. Further, an EMP is required to ensure sustainable development in the area of the project cogeneration site. The project activity is likely to provide a new economic fillip for the region as a whole. The EMP aims at controlling pollution at source to the extent possible, followed by treatment measures before they are discharged.

Construction phase

Air quality

The following mitigative measures were followed during the construction phase

- Spraying of water at regular intervals to suppress dust emissions from construction activities
- Covering construction materials during transportation
- Proper maintenance and periodic emission check for transportation vehicles
- Use of personal protective equipment (PPE) like goggles and nose masks to reduce impact of dust emissions during construction activities

Noise environment

The noise levels are within acceptable limits. Community noise levels are not likely to be affected because of vegetation and attenuation due to physical barriers. Earmuffs are provided to workers to be used during construction activities.

Operational phase

Air environment

The following mitigation measures will be adopted to keep under control impacts on air environment:

- Regular monitoring of air quality
- Installing of Electro Static Precipitator to control particulate matter
- Development of a green belt

Noise environment

- Providing absorbing as well as noise damping materials in all aspects of project activity
- Acoustical sealing should be done for all openings
- Provision of ear plugs, work rotation, adequate training
- Incorporation of noise control measures at source
- Sound proofing/ glass paneling of critical operating stations
- Regular noise level monitoring at the plant and surrounding area
- Plantation of green belt which acts as a attenuator of noise

Land and soil environment

- Improvement of soil quality and plantation of suitable tolerant species in the study area.

Water environment

- The water requirement should be restricted and should be conserved by recycling treated wastewater to the maximum extent.

Ecological environment

- Development of a greenbelt at the site of the project activity

Socioeconomic Environment

- Training to cane growers and farmers in order to improve productivity