CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL-SCALE PROJECT ACTIVITIES (SSC-CDM-PDD)
Version 02

CONTENTS

Revision history of this document

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

SECTION A. General description of the small-scale project activity

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

"Methane recovery and power generation in a distillery plant" by GMR Industries Ltd. (GIDL)
Date: 06.02.2006
Version: 1.0

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

This project activity is based at the distillery unit of integrated sugar complex of GMR Industries Ltd. (GIDL - Sugar Division) at Sankili village, Srikakulam District in the State of Andhra Pradesh. The company belongs to Rs. 25 billion GMR group having business interests in diversified fields of manufacturing of sugar, Ferro-Alloys, Rectified Spirit, Ultra Neutral Alcohol, Ethanol, etc., infrastructure, airports, power generation, roads, aviation, etc. The sugar plant is an ISO9000:2000 certified (in the year 2003) and has implemented ISO-9001:2000: system in its Co-generation Plant & Distillery/ETP as well.

The sugar division of the GMR Industries Ltd. (GIDL) has a sugar plant and a distillery along with a cogeneration plant in the same complex. The crushing capacity of the sugar plant is 3,125 tonnes per day and capacity of the distillery is 40 KLPD. The raw material to the distillery is molasses coming from the sugar plant. The major products from the distillery are Rectified Spirit (RS), ENA and Ethanol. The plant has modern Molecular Sieve Dehydration System. The plant is having zero pollution discharge.

The Spent-Wash generated from the distillery is high in BOD/COD content. The approx. quantity of Spent-Wash generated from the process is ~400 m3 per day. The BOD level of the Spent-Wash is in the range 55000-60000 mg/l and the COD is in the range of 130000-150000 mg/l. As per the norms of State Pollution Control Board and Central pollution Control Board (CPCB) in India this high BOD/COD Spent-Wash can not be discharged without proper treatment. The limit of BOD of the Spent-Wash for disposal in surface water is 30 mg/l and for disposal on land is 100 mg/l.

In normal course distilleries in India adopt open lagoons treatment system for meeting the pollution control standards of BOD/COD of the Spent-Wash before its discharge. But in open lagoon system Methane, a potent GHG, is generated due to the anaerobic conditions which escape into atmosphere and there is no control or capturing involved. This project activity from GIDL entails treatment of this high BOD/COD Spent-Wash anaerobically in a closed digester and capturing the Methane generated in a controlled manner. The Methane captured is combusted in a boiler for steam generation and further to generate power through a turbo-generator. The project activity also includes combustion of other GHG neutral biomass residue fuels such as rice-husk to supplement biogas fuel in the boiler. The capacity of the power generation plant is ~1.0 MW.

The project is a small scale CDM project activity and is based on Appendix B of "Simplified Baseline and Monitoring Methodologies for Selected Small Scale CDM Project Activity Categories"

Sustainability aspects of the project activity:
This project activity carries a number of sustainability aspects. It helps in recovery of Methane, a potent GHG which in normal course is emitted in open atmosphere due to decomposition of high BOD/COD Spent-Wash of distillery effluent. The project activity helps in conservation of natural resources such as

fossil fuels in power generation helping to some extent in national energy security. The project has also created employment opportunities both during erection & commissioning of the plant in the past and its operation and maintenance, currently. The plant comprises of Anaerobic Digester, Disc & Tube Reverse Osmosis Membrane - Module system and Manufacture of Bio-Compost that displaces highly energy-intensive Inorganic Fertiliser. The project activity would also provide the impetus to similar industries for adopting such measures in their distillery plants. The introduction of the project activity would also encourage technology providers to further their efforts in R&D of waste water treatment technologies bringing in investments.

GMR Group is known for its work for the community at large. Over the years GMR Group has helped the overall development of the region. Employment potential in rural areas has substantially increased throughout the year, avoiding migration of labour to other places for livelihood during lean seasons. The Group has also been carrying out its corporate social responsibilities with utmost priority. It has established GMR Foundation, a premier national body in the area of corporate social responsibility that have been actively involved in education, health, hygiene and rural empowerment. It has set up a number of educational institutes at primary, secondary & tertiary/professional levels, Mobile Medical Unit (MMU) in association of HelpAge India covering about 25 villages, Rural Entrepreneurship and Employment Generation Institutes in AP and Kerala, etc.

A few of the initiatives that GMR group has taken are –

Socio-Economic Development

- 415 people are employed directly in our factory.
- 1,000 people are employed, indirectly on the premises.
- Around 50,000 people are employed in the sugar cane zone are as farm-labour so that local people are prevented from migrating to other areas in search of their livelihood.
- Economic development and employment generation in the local are is achieved by various factors.
    - *Trucks, tractors and bullock carts are engaged in and around Sankili to carry sugarcane to the factory.*
    - *Many small hotels and provision stores are opened to meet the growing needs of the local area population.*

- Improvement of infrastructure like, road and other facilities.
- Educational Tours are conducted for the better exposure of the local farmers to modern technology and agricultural practices.
- Domestic Dairy Farming has been promoted in order to raise the income of farmers by about Rs. 1,500 per month, per cow.
- Cows are given on loan-basis to small farmers.
- GMR Foundation, in collaboration with Dayanand Anglovedic Educational Institution (DAV), has established a school with an investment of Rs. 2.50 Crores fro the benefit of the children of the employees, sugar-cane farmers and local populace.
- Eye-Camps are organized, periodically, for the benefit of the farmers and others too.
- Mobile Medical Unit is deployed in association with HelpAge India and GMR Varalakshmi Foundation, to provide free medical facility to the elderly people in the villages.

Our Achievements as Mile-stones

- ISO 9001: 2000 Certification in 2003.

- The Best Cane development Factory Award, for the year 2002-03, by the South Indian Sugar Cane and Sugar Technologist' Association (SISSTA).
- The S.V. Parthasarathy Memorial Award from SISSTA as the Best Performance Sugar Factory, for the year 2003-04.
- The Best Organization Award for Supporting Quality Circle Movement in Sep., 2004 and Sep., 2005 from The Quality Circle Forum of India, Hyderabad Chapter.
- May Day Award for `Best Management for the year 2004-05' by The Government of Andhra Pradesh.
- Best Sugar Factory in India, in Energy Conservation, for the year of 2005.
- Best Industrial Relations without any labour unrest and good relationship with farmers.
- We are implementing 5S Workplace Management Concepts in the factory.
- Implementation of ISO 14000 and OHSAS 18000 is at an advanced stage.
- CII National Award for Excellence in Energy Management 2005.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) Project participants (*) (as applicable)	Kindly indicate if the party involved wishes to be considered as project participant (yes/no)
Government of India	Private Entity, GMR Industries Ltd. (GIDL)	No

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

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

A.4.1.1. Host Party(ies):

India

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

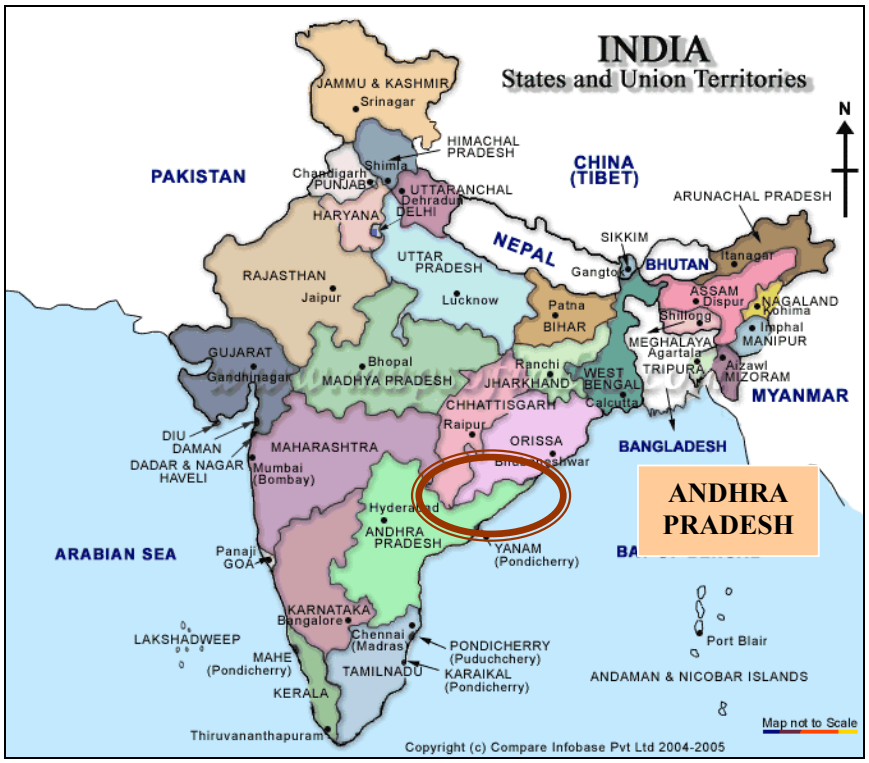
Andhra Pradesh

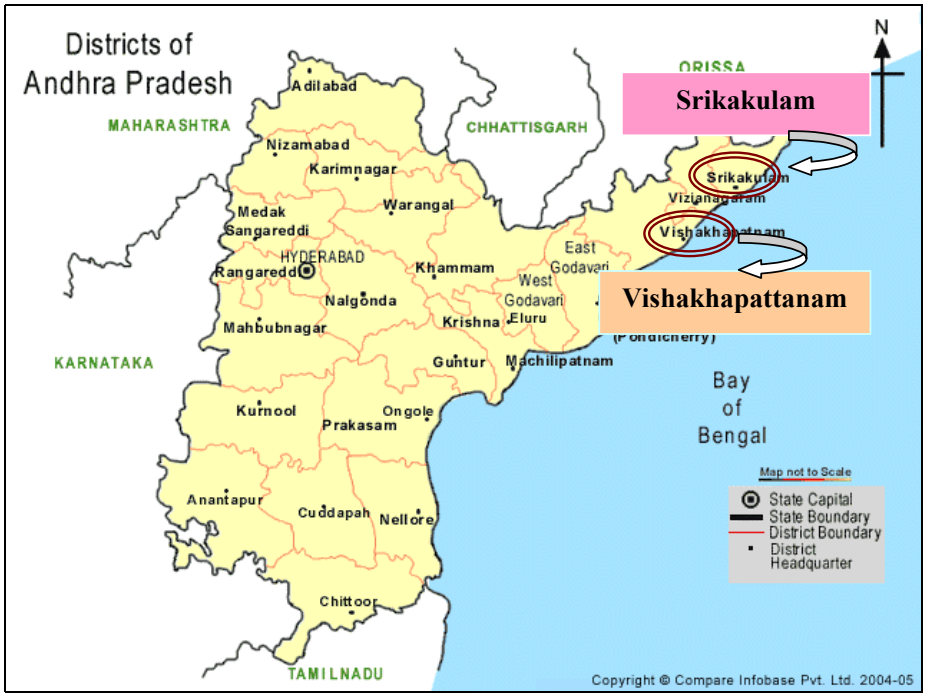
A.4.1.3. City/Town/Community etc:

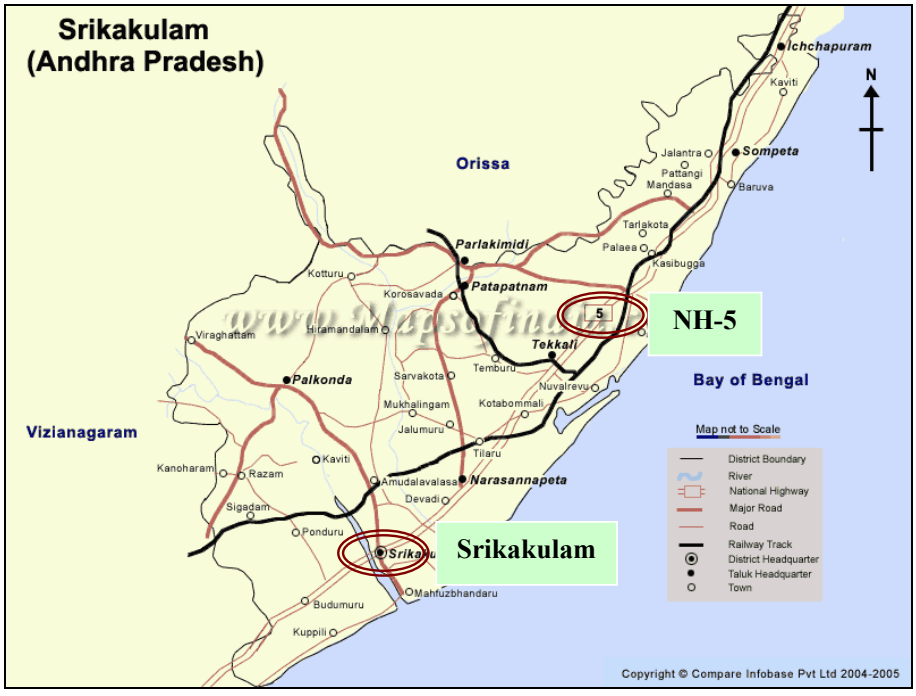
Village : Sankili
Mandal : Regidi
District : Srikakulam

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

The plant is located at the distillery unit of GMR Industries Ltd. (Sugar Division) at village Sankili of Regidi Mandal of Srikakulam District in Andhra Pradesh, India. The plant site is about 120 km from the nearest airport of Visakhapatnam on National Highway NH-5. The geographic location in which the project activity is located is depicted in the map below:







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

The project is a small scale CDM project activity and is based on Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

The project activity has two parts and conforms to the following categories-

TYPE IIIH: Methane Recovery in Wastewater Treatment

This project category comprises measures that recover methane from biogenic organic matter in wastewaters by means of ''Substitution of aerobic wastewater or sludge treatment systems with anaerobic systems with methane recovery and combustion''

TYPE ID: Grid connected renewable electricity generation

This category comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal, and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel or non-renewable biomass[6] fired generating unit. The generation capacity should be less than 15 MW, which is 1.0 MW in the project activity.

CSTR technology for anaerobic digestion of the Spent-Wash used in the project activity is proven and safe. Power generation is based on conventional steam-power route.

A.4.3. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small-scale project activity, taking into account national and/or sectoral policies and circumstances:

The project activity helps in GHG emission reduction in two ways-

1. Methane emission reduction through its controlled recovery in an anaerobic digestion plant
2. Reduction of emissions from fossil fuel based grid power by biogas and other biomass combustion in power generation plant

In the absence of the project activity the unit would have installed facilities to treat Spent-Wash in open lagoons and would not have captured the Methane. Also, it would have continued consuming grid power, which is primarily fossil fuel based and not taken up the biogas & biomass based power generation for meeting its electricity requirement.

The total of GHG emissions reduction from the project activity in tones of CO2 equivalent = 305931 tCO2e over the first crediting period of 7 years.

A.4.3.1 Estimated amount of emission reductions over the chosen crediting period:

Years	Annual estimation of emission reductions in tones of CO2 e
2006-07	42006
2007-08	42006
2008-09	42006
2009-10	42006
2010-11	42006
2011-12	42006
2012-13	42006

Total estimated reductions (tonnes of CO2 e**)**	305931
Total number of crediting years	7 years (twice renewable crediting period, total 21 years)
Annual average over the crediting period of estimated reductions (tonnes of CO2e**)**	42006

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

No public funding from parties included in Annex I is available to the project activity.

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

As per Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities– "A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

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

The project activity is not a de-bundled component of a large project activity as –
There is no small scale CDM project activity or an application registered by GMR Industries Ltd. in the same project category in the last two years within 1 km of the project boundary of the proposed small-scale project activity.

SECTION B. Application of a baseline methodology:

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

The project is a small scale CDM project activity and is based on Appendix B (Version No. 07 dated 28 November 2005) of the simplified modalities and procedures for small-scale CDM project activities. The project activity conforms to the following categories-

Category	Technology/ measure
TYPE IIIH: Methane Recovery in Wastewater Treatment	Comprises Methane recovery and combustion from waste water treatment facilities.
TYPE ID: Grid connected renewable electricity generation	Comprises renewable energy generation units that displaces electricity based on at least fossil fuel fired generating stations

B.2 Project category applicable to the small-scale project activity:

Category	Applicability Criteria	Project Status

TYPE IIIH: Methane Recovery in Wastewater Treatment	*This project category comprises measures that recover methane from biogenic organic matter in wastewaters by means of* *''Introduction of methane recovery and combustion to existing anaerobic wastewater or sludge treatment systems.''*	The project activity entails recovery of methane generated in the spent-wash treatment facility of GMR.
TYPE ID: Grid connected renewable electricity generation	*This category comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal, and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel or non-renewable biomass[6] fired generating unit.*	Project activity is a renewable energy generation unit that displaces largely fossil fuel based grid power.
	If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires non-renewable biomass or fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW.	The capacity of power generation is ~1.0 MW in the project activity.

Important information for determination of baseline scenario:

Methane recovery in Spent-Wash treatment	COD of Spent-Wash going into digester
	COD of Spent-Wash coming out from the digester outlet
	Quantity of Spent-Wash flow into digester
	Max. Methane producing capacity of Spent-Wash
	Methane conversion factor
Power generation	Weighted average emissions of current generation mix in the (Indian) Southern Grid
	Quantity of biogas combusted in the boiler
	Quantity of other biomass i.e. rice-husk in the boiler
	Quantity of fossil fuels combusted in the boiler

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

Proposed project activity is eligible to use simplified methodologies as,

- It conforms to project category in "Appendix B of the simplified modalities & procedures for small scale CDM-project activities under TYPE IIIH– "Methane Recovery in Wastewater Treatment" & TYPE ID-"Grid connected renewable electricity generation"
- The project activity is a Methane recovery and its combustion from a Spent-Wash treatment facility .Both the measures will reduce anthropogenic emissions by sources and directly emit less than 15 kilotonnes of carbon dioxide equivalent annually as required by category IIIH
- It is renewable energy project that displaces grid electricity which is largely based on fossil fuel combustion and is less than 15 MW (Capacity is only 1.0 MW).
- It is not a debundled component[1] of a larger project activity, as it qualifies guidelines in "appendix C to the simplified M&P for the small-scale CDM project activities for guidance on how to determine whether the proposed project activity is not a debundled component of a larger project activity".

Establishing Baseline & Additionality

Project Alternatives:

1. Installing less cost intensive open lagoons for Spent-Wash treatment and meeting the electricity demand from the grid supplied power.
2. Installation of a Spent-Wash treatment facility based on anaerobic digestion and capturing Methane in a controlled way from the system to use in a power generation unit.

Additionality of the project activity has been established as per the guidelines suggested in Attachment A to Appendix B.

Investment barrier

As per the Waste Water treatment laws of State Pollution Control Board & guidelines of Central Pollution Control Board, Spent-Wash needs to be treated to a level where BOD level is below 100 mg/l for disposal on land and less than 30 mg/l for disposal in surface water and industry is free to achieve this using whichever technology it deem fit. Generally the distilleries in India have the open lagoon system for treatment of this high BOD/COD water, which are equally effective and less cost intensive. But in open lagoon system Methane generated due to decomposition of waste escape into open atmosphere and there is no Methane capturing involved. Methane is a potent GHG and thus harmful to our environment.

GIDL being conscious towards its social responsibilities has always adopted technologies which have helped in sustainable development of the region. Due to this it adopted the project activity of controlled decomposition of waste in a digester and captures the Methane generated. However it required more on the part of GIDL in terms of investments, managerial intervention and operation and maintenance controls of the technology. It also has to invest in other related facilities such as laboratory infrastructure at the site for the analysis of wastes, production & control of bacteria for the digester etc. The project activity also involves power generation using the captured Methane in the decomposition plant and so required additional investments in turbine, boiler, allied systems, required controls and suitably skilled human resource.

[1] Refer section A.4.5

The project activity has a low IRR of 11.68% which is much lower than Weighted Average Cost of Capital (WACC) for the project 14.72%. A financially more viable option (open lagoon) would have led to higher GHG emissions however GMR group decided to invest in the project primarily due to the following reasons:

- The project was environmentally positive
- The project became investible after accounting for benefits from carbon credits

Summary of Financial analysis of project	
Capacity	900 KW
Project Cost	50.61 Million INR
Means of financing	70% Debt (590 mn), 30% Equity
Plant load factor	90%
Project IRR without CERs	11.68%
Project IRR with CERs	22.98%
WACC	14.72%

Technological barrier

For GMR group this project is first of its kind. They didn't have any prior experience for operating such processes. The project activity has a few limitations over other treatment procedures i.e. low rate of process reaction, long start up period, requirement of culture of micro organisms in controlled atmosphere, maintaining adequate temperature and pH levels. This needs in-depth understanding of the process and its controls, which requires continuous supervision and involvement of very high degree of technological intervention.

Common Practices Analysis

Andhra Pradesh has 38 sugar manufacturing industries, of which 11 are cooperative sugar factories, 3 joint ventures and 24 are privately owned sugar factories. Among these there were not many sugar plants, which are having distilleries using the technology of Methane capturing and in power generation by Methane combustion.

Regulatory or policy requirements

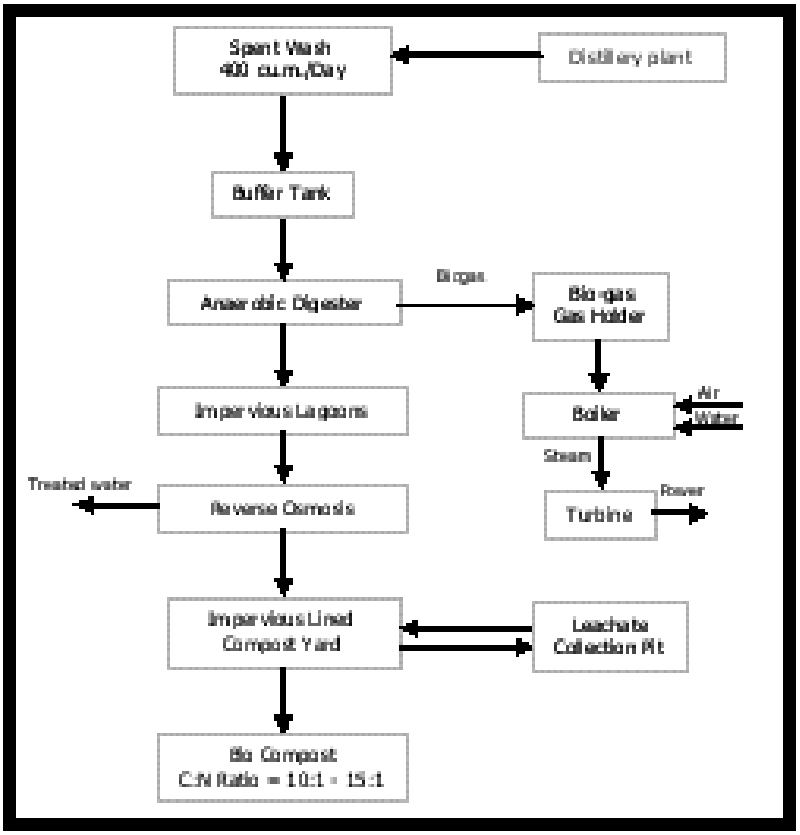
As per the norms of central Pollution Control Board in India, the Spent-Wash with high BOD/COD should not be discharged in open fields or surface water streams without treatment. The limit for BOD levels is 100 mg/L for discharging on surface water and 30 mg/L for surface water. There is no regulatory or policy requirement on selection of technology for Spent-Wash treatment in industrial facilities. So, the technology adopted in the project activity is not choice for treatment due to high cost involved (as much as US$ 5.76 Million, as against US$ 0.50 Million) and the requirement of keener controls in technology.

Summary

The proposed project activity is not a business-as-usual scenario and carries investment & technology risks and thus qualifies the additionality tests. The project activity is not a common practice in the region and also not mandated by law. These investment & technology barriers stall implementation of such type of project activity as evident by region's poor performance on account of less number of such installations.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the small-scale project activity:

The project boundary is the physical, geographical site of the Methane recovery facility & that of the renewable power generation delineates the project boundary.



B.5. Details of the baseline and its development:

Please refer section B.3 for details of the key steps adopted for determining the baseline for the project activity.

GMR Industries Limited (Sugar Division)
Sankili, Regidi, Amadalavalasa Mandal,
Srikakulam District - 532 440
Andhra Pradesh, India
T: +91-8941-237546/535/37/514
F: +91-8941-237516)

SECTION C. Duration of the project activity / Crediting period:

C.1. Duration of the small-scale project activity:

C.1.1. Starting date of the small-scale project activity:

July 2005

C.1.2. Expected operational lifetime of the small-scale project activity:

30 years

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

C.2.1. Renewable crediting period:

21 years

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

01st April, 2006

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

C.2.2.2. Length:

SECTION D. Application of a monitoring methodology and plan:

D.1. Name and reference of approved monitoring methodology applied to the small-scale project activity:

The project is a small scale CDM project activity and is based on Appendix B (Version No. 07 dated 28 November 2005) of the simplified modalities and procedures for small-scale CDM project activities. The project activity conforms to the following categories-

Project Category	Criteria
TYPE IIIH : Methane Recovery in Wastewater Treatment	Comprises Methane recovery from Spent-Wash treatment facilities.
TYPE ID : Grid connected renewable electricity generation	Comprises renewable energy generation units that displaces electricity based on at least fossil fuel fired generating stations

D.2. Justification of the choice of the methodology and why it is applicable to the small-scale project activity:

Category	Monitoring Requirement	Project Status

TYPE IIIH: Methane Recovery in Wastewater Treatment	*The amount of Methane recovered and used as fuel or combusted shall be monitored, using continuous flow meters and analyzing the Methane content of the combusted gases either online, or with periodic measurements.* *Temperature and pressure of methane gas are required to determine the density of methane combusted.*	The biogas recovered is measured using on-line gas flow meters. The gas samples are tested in the in-house laboratory for Methane content and calorific value of biogas. Temperature and pressure are measured using on-line meters.
	Regular maintenance should ensure optimal operation of flares. The flare efficiency, defined as the fraction of time in which the gas is combusted in the flare, multiplied by the efficiency of the flaring process, shall be monitored.	The plant has implemented ISO 9001:2000 standards. And has annual maintenance and calibration system in place for equipments/ instruments, which are religiously adhered to. Audits are also conducted in a planned manner.
	If the methane emissions from anaerobic decay of the final sludge were to be neglected because the sludge is controlled combusted, disposed in a landfill with methane recovery, or used for soil application, then the end-use of the final sludge will be monitored during the crediting period.	End-use of final sludge is monitored in the plant on a regular basis. The plant is Zero Pollution Discharge Plant.
TYPE ID: Grid connected renewable electricity generation	*Monitoring shall consist of metering the electricity generated by the renewable technology. In the case of co-fired plants, the amount of biomass and fossil fuel input shall be monitored.*	Energy meters are in place to monitor the electricity generated from the plant. Also, gas flow meter shall account for the biogas combusted in the boiler and weigh scales are used to account for the quantity of other fuels combusted in the plant.

D.3 Data to be monitored:

ID number	Data Source	Data variable	Data unit	Measured (m), calculated © or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data to be kept?	Comment
1.1	Plant Data	Flow of Spent-Wash in digester	M3	*m*	*Daily*	*100%*	*Electronic*	*Credit period + 2 yrs*	
1.2	Lab test data	Chemical Oxygen Demand of untreated Spent-Wash into the digester	Kg COD/m3	*m*	*Daily*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	
1.3	Lab test data	Chemical Oxygen Demand of treated water from digester	Kg COD/m3	*m*	*Daily*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	
1.4	Plant data	Methane generated in the digester	M3	c	*Daily*	100%	*Electronic*	*Credit period + 2 yrs*	
1.5	Plant data	Biogas flow into boiler	Nm3	*e*	*Daily*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	
1.6	Lab test data	%CH4, Volumetric content of Methane in biogas	%	*e*	*Daily*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	
1.7	Plant data	Pressure of Methane	Kg/cm2	*M*	*Daily*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	
1.8	Plant data	Temp. of Methane	Deg C	*m*	*Daily*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	
1.9	Plant data	Density of Methane	Kg/Nm3	*e/ m*	*Yearly*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	
1.10	Plant data	Gross Electricity generated in the power plant	MWh	*m*	*Monthly*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	
1.11	Plant data	Auxiliary Electricity Consumption	MWh	*m*	*Monthly*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	
1.12	Plant data	Net electricity generation	MWh	*c*	*Monthly*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	
1.13	Plant data	Quantity of fossil fuel i combusted in boiler	Tonnes	*m*	*Monthly*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	
1.14	Lab test data	NCV of fossil fuel i combusted	TJ/ tonne	*c*	*Monthly*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	

1.15	Plant data	Power consumed in equipment in digester plant	MWh	*m*	*Monthly*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	
1.16.1	SREB data	Plant name	Text	*e*	*Yearly*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	
1.16.2	SREB data	Fuel type	Text	*e*	*Yearly*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	
1.16.3	SREB data	Electricity delivered to the grid by source k	MWh	*e*	*Yearly*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	
1.16.4	SREB data	Amount of fuel i from power sourcekj in year y	Tonnes	*c*	*Yearly*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	
1.16.5	IPCC default value	CO2 emission coefficient of fuel i from power source k in year y	tCO2/ tonne	*e*	*Yearly*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	
1.16.6	IPCC default value	Net calorific value of fuel i	TJ/ tonne	*e*	*Yearly*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	
1.16.7	IPCC default value	Emission factor per unit of fuel i	tCO2/ TJ	*e*	*Yearly*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	
1.16.8	IPCC default value	Oxidation factor of the fuel i	Number	*e*	*Yearly*	*100%*	*Electronic/ paper*	*Credit period + 2 yrs*	

D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
Table D.3 (ID numbers from 1.1-1.15	Low	The data will be collected as part of normal plant level operations. QA/QC requirements consist of cross- checking these with other internal company report.
Table D.3 (ID numbers from 1.16.1-1.16.8)	Low	Referred data is from Central Electricity authority and from the data source of various state electricity boards in the southern region. References are given in relevant worksheets to validating agency.

D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:

Project Management Planning:
A CDM project team will be constituted with participation from various departments like production, finance, purchase and quality. People will be trained on CDM concept and monitoring plan. This team will also be responsible for data collection and archiving.

This team will meet periodically to review CDM project activity check data collected, emissions reduced etc. A plan is developed to take care of meter calibration, maintenance of meters etc. This plan is part of usual plant operation & maintenance procedure.

Please refer Annex 5 for details.

D.6. Name of person/entity determining the monitoring methodology:

GMR Industries Limited (Sugar Division)
Sankili, Regidi, Amadalavalasa Mandal,
Srikakulam District - 532 440
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SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

E.1.1 Selected formulae as provided in appendix B:

Project Activity Direct Emissions
Total annual project activity related emissions shall be less than or equal to 15 kilo tonnes of CO_2 equivalent.

A.

$$PE_y = PE_{y,\,power} + PE_{y,ww,treated} + PE_{y,s,final} + PE_{y,fugitive} + PE_{y,dissolved}$$

where:

PE_y:	project activity emissions in the year "y" (tonnes of CO_2 equivalent)
$PE_{y,power}$	emissions through electricity or diesel consumption in the year "y"
$PE_{y,ww,treated}$	emissions through degradable organic carbon in treated wastewater in year "y"
$PE_{y,s,final}$	emissions through anaerobic decay of the final sludge produced in the year "y". If the sludge is controlled combusted, disposed in a landfill with methane recovery, or used for soil application, this term can be neglected, and the destiny of the final sludge will be monitored during the crediting period.
$PE_{y,fugitive}$	emissions through methane release in capture and flare systems in year "y".
$PE_{y,dissolved}$	emissions through dissolved methane in treated wastewater in year "y"

B.

$$PE_{y,ww,treated} = Q_{y,ww} * COD_{y,ww,treated} * B_{o,ww} * MCF_{ww} * GWP\_CH_4$$

where:

$Q_{y,ww}$	volume of wastewater treated in the year "y" (m^3)
$COD_{y,ww,treated}$	chemical oxygen demand of the treated wastewater in the year "y" (tonnes/m^3)
$B_{o,ww}$	methane generation capacity of the treated wastewater (IPCC default value of 0.25 kg CH_4/kg COD)
$MCF_{ww,treated}$	methane conversion factor for the anaerobic decay of wastewater. (default value of 0.5 is suggested)[1].
GWP_CH4	Global Warming Potential for CH4 (value of 21 is used)

C.

$$PE_{y,s,final} = S_{y,final} * DOC_{y,s,final} * DOC_F * F * 16/12 * GWP\_CH_4$$

where:

$PE_{y,s,final}$	Methane emissions from the anaerobic decay of the final sludge generated in the wastewater system in the year "y" (tonnes of CO_2 equivalent)
$S_{y,final}$	Amount of final sludge generated by the wastewater treatment in the year y (tonnes).
$DOC_{y,s,final}$	Degradable organic content of the final sludge generated by the wastewater treatment in the year y (mass fraction). It can be measured by sampling and analysis of the sludge produced, or the IPCC default value for solid wastes of 0.3 is used.
DOC_F	Fraction of DOC dissimilated to biogas (IPCC default value is 0.77).
F	Fraction of CH_4 in landfill gas (IPCC default is 0.5).

D.

$$PE_{y,fugitive} = PE_{y,fugitive,ww} + PE_{y,fugitive,s}$$

where:

$PE_{y,fugitive,ww}$ Fugitive emissions through capture and flare inefficiencies in the anaerobic wastewater treatment in the year "y" (tonnes of CO_2 equivalent)

$PE_{y,fugitive,s}$ Fugitive emissions through capture and flare inefficiencies in the anaerobic sludge treatment in the year "y" (tonnes of CO_2 equivalent)

$$PE_{y,fugitive,ww} = (1 - CFE_{ww}) * ME_{y,ww,untreated} * GWP\_CH_4$$

where:

CFE_{ww} capture and flare efficiency of the methane recovery and combustion equipment in the wastewater treatment (a default value of 0.9 shall be used, given no other appropriate value)

$ME_{y,ww,untreated}$ methane emission potential of the untreated wastewater in the year "y" (tonnes)

$$ME_{y,ww,untreated} = Q_{y,ww} * COD_{y,ww,untreated} * B_{o,ww} * MCF_{ww,untreated}$$

where:

$COD_{y,ww,untreated}$ Chemical oxygen demand of the wastewater entering the anaerobic treatment reactor/system with methane capture in the year "y" (tonnes/m^3)

$MCF_{ww,untreated}$ methane conversion factor for the anaerobic decay of the untreated wastewater (IPCC default value of 1.0 for anaerobic systems. If the untreated wastewater is discharged to the environment, the default value of 0.5 is suggested).

$$PE_{y,fugitive,s} = (1 - CFE_s) * ME_{y,s,untreated} * GWP\_CH_4$$

where:

CFE_s capture and flare efficiency of the methane recovery and combustion equipment in the sludge treatment (a default value of 0.9 shall be used, given no other appropriate value)

$ME_{y,s,untreated}$ methane emission potential of the untreated sludge in the year "y" (tonnes)

$$ME_{y,s,untreated} = S_{y,untreated} * DOC_{y,s,untreated} * DOC_F * F * 16/12$$

where:

$S_{y,untreated}$ amount of untreated sludge generated in the year "y" (tonnes)

$DOC_{y,s,untreated}$ Degradable organic content of the untreated sludge generated in the year y (mass fraction). It can be measured by sampling and analysis of the sludge produced, or the IPCC default value for solid wastes of 0.3 is used.

E.

$$PE_{y,dissolved} = Q_{y,ww} * [CH_4]_{y,ww,treated} * GWP\_CH_4$$

where:

$[CH_4]_{y,ww,treated}$ dissolved methane content in the treated wastewater (tonnes/m^3). In aerobic wastewater treatment default value is zero, in anaerobic treatment it can be measured, or a default value of 10e-4 tonnes/m^3 can be used.

Baseline

For Spent-Wash Treatment part:

The existing anaerobic wastewater or sludge treatment system without methane recovery and combustion, in the case of the introduction of methane recovery and combustion units to one or both of these systems.

For the above cases the methane generation capacity of the treated wastewater ($B_{o,ww}$) shall be IPCC lower value of 0.21 kg CH_4/kg .COD.

$BE_y = ME_{y,ww,untreated}$

For Power Generation Part:
The baseline is emissions due to the equivalent power generation in Southern Grid.

$\mathbf{BE}_{2,Y}$ = $\mathbf{NET}_{ELE,y}$ **X** $\mathbf{GEF}_y$

Where;

$NET_{ELE,y}$ = Net electricity generation from the power plant in year y, MWh/ y

GEF_y = Grid emission factor in southern grid estimated as per ACM0002[2], tCO2e/ MWh

Leakage
If the used technology is equipment transferred from another activity or if the existing equipment is transferred to another activity, leakage effects at the site of the other activity are to be considered.

No leakage calculation is required as per the Appendix B of the simplified modalities and procedures for small-scale CDM project activities as there is no energy generating equipment is transferred from another activity or no existing equipment is transferred to another activity.

E.1.2 Description of formulae when not provided in appendix B:

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the small-scale project activity emissions:

Year	Emissions in the project activity
	tCO2/yr
2006-07	4608
2007-08	4608
2008-09	4608
2009-10	4608

[2] refer Annex 3

2010-11	4608
2011-12	4608
2012-13	4608

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities:

Year	Emissions in the Baseline
	tCO2/yr
2006-07	46615
2007-08	46615
2008-09	46615
2009-10	46615
2010-11	46615
2011-12	46615
2012-13	46615

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

Year	Emissions in the Baseline	Emissions in the project activity	Leakage	Emissions Reduction
	tCO2/yr	tCO2/yr	tCO2/ yr	tCO2/yr
2006-07	46615	4608	0	42006
2007-08	46615	4608	0	42006
2008-09	46615	4608	0	42006
2009-10	46615	4608	0	42006
2010-11	46615	4608	0	42006
2011-12	46615	4608	0	42006
2012-13	46615	4608	0	42006

E.2 Table providing values obtained when applying formulae above:

Year	Emissions in the Baseline	Emissions in the project activity	Emissions Reduction
	tCO2/yr	tCO2/yr	tCO2/yr

2006-07	46615	4608	42006
2007-08	46615	4608	42006
2008-09	46615	4608	42006
2009-10	46615	4608	42006
2010-11	46615	4608	42006
2011-12	46615	4608	42006
2012-13	46615	4608	42006

SECTION F.: Environmental impacts:

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

EIA study was conducted at the time of project assessment. The impact of the project activity was assessed on the environment i.e. air, water, soil taking into account the various aspects during construction and operation of the project. The impacts from the project activity were found out to be positive. The project activity entails adopting the environment friendly measures to prevent any damage to the environment. This plant from the project proponent is a Zero Pollution Discharge Plant.

SECTION G. Stakeholders' comments:

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

Stakeholder consultation for the project activity has been conducted to account for the views of the people impacted either directly or indirectly due to the project activity. This has been carried out for all levels of stakeholders i.e. local populace by conducting a meeting and explaining them about the project, its impact on the environment and asking for their comments/ suggestions if any. The people interacted on a number of things. The process was carried out for taking the views of Gram Panchayat, the local representative of the village and district authorities as well. Also, GIDL has invited views of one and all through newspaper advertisement.

G.2. Summary of the comments received:

GIDL invited views of people at all levels i.e. through local meetings, newspaper advertisements, consultation with Gram Panchayat representatives and district authorities. People responded to the call and presented their views, comments and offered suggestions, which GIDL responded to appropriately. Project activity was found to be having only positive impact on people in general.

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

No adverse comment from stakeholders on the project activity received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	GMR Industries Ltd. (sugar Division)
Street/P.O.Box:	Sankili
Building:	Amadalavalasa
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Represented by:	
Title:	Mr.
Salutation:	
Last Name:	Rao
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No ODA funding for the project activity.

Annex 3

Baseline Information:

Estimation of baseline emissions
Baseline scenario is that the electricity generated by the project would otherwise have been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations (for SR Grid) described below.

Step 2.1: Calculate the Operating Margin emission factor ($EF_{OM,y}$)

ACM0002, version 05 dated 03 March 2006, suggested following methods to calculate the Operating Margin emission factor(s) ($EF_{OM,y}$):

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch Data Analysis OM, or

(d) Average OM.

As per the approved methodology ACM0002 Dispatch data analysis should be the first methodological choice. However due to lack of data availability 'Dispatch Data Analysis' is not selected for the project activity.

The Simple adjusted OM and Average OM methods are applicable to project activities connected to the project electricity system (grid) where the low-cost/must run resources constitute more than 50% of the total grid generation.

'Simple OM' method is applicable to project activity connected to the project electricity system (grid) where the low-cost/must run resources constitute less than 50% of the total grid generation in 1) average of the five most recent years, or 2) based on long-term normal for hydroelectricity production.

The low-cost/must run resources contribute to less than 50% of total power in the grid hence 'Simple OM' option has been chosen.

Generation Mix of Power in Southern Grid

Type	2002-03	2003-04	2004-05
Thermal	93350.1	96664.0	97964.3
Diesel	4457.0	3225.0	2370.1
Gas	15138.0	16183.0	12276.6
Total (Thermal + Gas)	**112945.1**	**116072.0**	**112611.1**
Wind*	1577.3	2055.7	1270.7
Hydro	18167.8	17317.0	25280.4
Nuclear	4390.0	4700.0	4406.7
Low cost/Must run	**24135.1**	**24072.7**	**30957.8**
Total	**137080.1**	**140144.7**	**143568.8**
% of Low cost/must run	**18%**	**17%**	**22%**

Unit Million Units
Source www.cea.nic.in

The Simple OM emission factor ($EF_{OM,simple,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MU) of all generating sources serving the project electricity system, not including low-operating cost and must-run power plants.

The Simple OM emission factor can be calculated using either of the two following data vintages for years(s) y:

- A 3-year average, based on the most recent statistics available at the time of PDD submission, or
- The year in which project generation occurs, if $EF_{OM,y}$ is updated based on ex post monitoring.

The project activity uses the OM emission factor as per the 3-year average of Simple OM calculated based on the most recent statistics available at the time of PDD submission.

Source	MoU	OM (2002-03)	OM (2003-04)	OM (2004-05)
Year-wise OM	tCO2/ MWh	0.952	0.978	0.992
OM	tCO2/ MWh	0.974		

Emissions due to imports from other grids into the southern grid have been considered as "0 tCO2/MWh". This is conservative.

Step 2.2: Calculate the Build Margin emission factor ($EF_{BM,y}$)

As per the methodology the Build Margin emission factor ($EF_{BM,y}$) is calculated as the generation-weighted average emission factor (tCO_2/MU) of a sample of power plants. The project activity calculates the Build Margin emission factor $EF_{BM,y}$ ex ante based on the most recent information available on plants already built for sample group m at the time of PDD submission.

The sample group *m* consists of either:

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

As per the baseline information data the option (b) comprises the larger annual generation. Therefore for the project activity the sample group m consists of power plants capacity additions in the electricity system that comprise 20% of the system generation (in MU) and that have been built most recently. Power plant capacity additions registered as CDM project activities are excluded from the sample group.

Step 2.3: Calculate the Electricity Baseline Emission Factor ($EF_{electricity,y}$)

Electricity baseline emission factor is calculated as the weighted average of the Operating Margin emission factor (*EFOM,y*) and the Build Margin emission factor (*EFBM,y*) where the weights *wOM* and *wBM*, by default, are 50% (i.e., *wOM* = *wBM* = 0.5). This is presented in the table below.

Source	MoU	OM (2002-03)	OM (2003-04)	OM (2004-05)
Year-wise OM	tCO2/ MWh	0.952	0.978	0.992
OM	tCO2/ MWh	0.974		

BM	tCO2/ MWh	0.716
Emission Factor-CM	tCO2/ MWh	**0.845**

Annex 4

Technology Details

Power Generation unit:

Turbine Specification:

Steam turbine Model	PRSB 150
Inlet Steam pr.	43 ata
Inlet Steam Temp.	425 Deg C
Exhaust Steam Pr.	4 ata
Max. Steam flow	10.5 TPH
Turbine Rated Speed	8142 RPM
Rated Power	970 kW
No of stages	05

Boiler Specification:

Make	Cheema Boilers ltd.
Capacity	10.5 TPH
Boiler Type	Power Pack-FBC
Superheated steam pr.	44 kg/cm2
Superheated steam temp.	430 +- 5 Deg C

ESP:

Make	Thermax Ltd.
Model	SC-9-16-16G-(3X1.25)-1.2P
Number of fields	3

Annex 5

Project Monitoring Plan

GIDL's Sugar Division is an ISO-900:2000 certified and it's Distillery, including Effluent Treatment Plant (ETP) - where the project activity exists and maintains all production/purchase/sales records as per audit guidelines. GIDL has procedures in place for operation and maintenance of the plant machinery, equipments and instruments and it maintains data on maintenance & calibration of the equipments. The equipments used for CDM project would be the part of these procedures and document on maintenance and rectification done on all the monitoring equipments are maintained.

At GIDL, there are a number of departments of operation, maintenance, purchase, stores, finance, accounts, laboratory and others. Each department is headed by one Department Head supported by shift-in-charges and support staff i.e. operators and etc. The overall responsibility of the department functioning is with the respective departmental head. Maintenance sections include mechanical, electrical and instrumentation departments. These are responsible for the overall upkeep of plant machinery and instruments.

The project activity is in the distillery unit of the sugar complex, headed by Mr. K. Sreerama Murthy, A.G.M. and Mr. Kiran Kumar, Dy. Manager is the in-charge and responsible for the overall functioning of the Effluent Treatment Plant (ETP), a part of this Distillery.

The methodology requires monitoring of the following:

1. In the biomethanation plant; generation of biogas, Methane content in the biogas, waster water flow into digester, outflow of Spent-Wash after treatment in the digester, COD/BOD level of waster water at digester inlet and outlet.
2. Monitoring fuel use and output in the power generation plant at the distillery - e.g. fuel use and power output by the unit.
3. In the case of coal, the emission coefficient shall be based on test results for periodic samples of the coal purchased if such tests are part of the normal practice for coal purchases.

A CDM champion team will be constituted with participation from Operation, Maintenance, Purchase & Stores, Quality, Sales & Marketing, R&D and finance. This team will first be trained about CDM concepts and then they will be given the responsibility of collecting & maintaining data. This team will meet periodically (Proposed period of 3 months) to review CDM project activity and also to check data collected to estimate emissions reduction. One person dedicated to CDM related activity will be appointed. This person would be responsible for gathering data from all relevant functions, and to keep records of the same. This person will report to CDM team.

GIDL shall adopt the following procedures to assure the completeness and correctness of the data needed to be monitored for CDM project.

Formation of CDM Team:

A CDM project team would be constituted with participation from relevant departments. People would be trained on CDM concept and monitoring plan. This team will be responsible for data collection and archiving. This team will meet periodically to review CDM project activity check data collected, emissions reduced etc. On a weekly basis, the monitoring reports are checked and discussed by the senior CDM team members/managers. In case of any irregularity observed by any of the CDM team member, it is informed to the concerned person for necessary actions. On monthly basis, these reports are forwarded to the management level.

- ***Unit Head:*** Overall responsibility of compliance with the CDM monitoring plans.
- ***Head of Distillery:*** Responsibility for completeness of data, reliability of data (calibration of meters), and monthly report generation
- ***In-charge of E.***T.P.: Responsibility for completeness of data, reliability of data (calibration of meters), and monthly report generation
- ***Shift In-charge:*** Responsibility of daily report generation

Training of CDM team personnel:
The training of the CDM team and plant personnel will be carried out on CDM principle, CDM activities, monitoring of data and record keeping through a planned schedule made in advance and a record of various training programmes undertaken would be kept for verification.

Day to day data collection and record keeping:
Plant data shall be collected on operation under the supervision of the respective Shift-in-charge and record would be kept in daily logs.

Reliability of data collected-
Testing the meters every half yearly basis checks the reliability of the meters. Documents pertaining to testing of meters shall be maintained.

Frequency-
The frequency for data monitoring shall be as per the monitoring details in Section D of this document.

Calibration of instruments:
GIDL'S Sugar Mill is an ISO-9001:2000 certified company and it has procedures well defined for the calibration of instruments. A log of calibration records is maintained. Instrumentation department in the company is responsible for the upkeep of instruments in the plant.

Maintenance of instruments and equipments used in data monitoring:
The operation department shall be responsible for the proper functioning of the equipments/ instruments and shall inform the concerned department for corrective action if found not operating as required. The concerned department shall take corrective action and a report on corrective action taken shall be maintained as done time to time along with the details of problems rectified.

Checking data for its correctness and completeness:
The CDM team would have the overall responsibility of checking data for its completeness and correctness. The data collected from daily logs is forwarded to the central lab after verification from respective departments.

Internal audits of CDM project compliance:
CDM audits shall be carried out to check the correctness of procedures and data monitored by the internal auditing team entrusted for the work. Report on internal audits done, faults found and corrective action taken shall be maintained and kept for external auditing.

Emergency preparedness:
The project activity does not result in any unidentified activity that can result in substantial emissions from the project activity. No need for emergency preparedness in data monitoring is visualized.

Report generation on monitoring:
After verification of the data and due diligence on corrective ness if required an annual report on monitoring and estimations shall be maintained by the CDM team and record to this effect shall be maintained for verification.

Annex 6

Glossary of terms	
UNFCCC	United Nations Framework Convention on Climate Change
DNA	Designated National Authority
MoEF	Ministry of Environment & Forest
CDM	Clean Development Mechanism
IPCC	Intergovernmental Panel on Climate Change
CER	Certified Emissions Reduction
DOE	Designated Operational Entity
CEA	Central Electricity Authority
BOD	Bio-chemical Oxygen Demand
COD	Chemical Oxygen Demand
MCF	Methane Conversion factor
SREB	Southern Region Electricity Board
OM	Operating Margin
BM	Build Margin
CM	Combined Margin