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:

"Energy efficiency measures in a sugar plant" by GMR Industries Ltd (GIDL)
Version: 1.0;
Date: 16.02.2006

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

This project activity is based at the integrated sugar complex of GMR Industries Ltd. (GIDL) 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 sugar, Ferro-Alloys, Ethanol, Rectified Spirit, Extra Neutral Alcohol, renewable energy infrastructure, power generation, roads, etc. The sugar plant is ISO-9001 certified, in 2003.

The plant has undergone energy audits time to time internally as well as by external agencies, identified and implemented several energy saving measures in the plant. The energy conservation pertains to electricity as well as steam savings in the plant. The baseline for the electricity savings is southern region grid power generation and for steam it is the existing consumption of fossil fuel in steam generation.

GIDL has been recognised for its efforts in energy conservation in its plants -

- **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.
- Best Sugar Factory in India, in **Energy Conservation**, for the year of 2005.
- **CII National Award for Excellence in Energy Management 2005.**

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:
The project activity has a number of sustainability aspects associated with it as discussed below –

The energy efficiency measures from GIDL has helped in energy conservation and contributing to an extent to enhancing regional/ national energy security. Less use of electricity saves fuels for related power generation. Power generation results into emissions of gases such as NOx, SOx into atmosphere, this activity shall help in reducing these emissions. The measures adopted in the sugar plant shall encourage many more such plants to implement these measures. The project activity shall also bring into focus the need of energy conservation in sugar plants and bring in more investments and efforts in R&D for developing newer technologies leading to further energy saving opportunities.

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):

Country: India

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

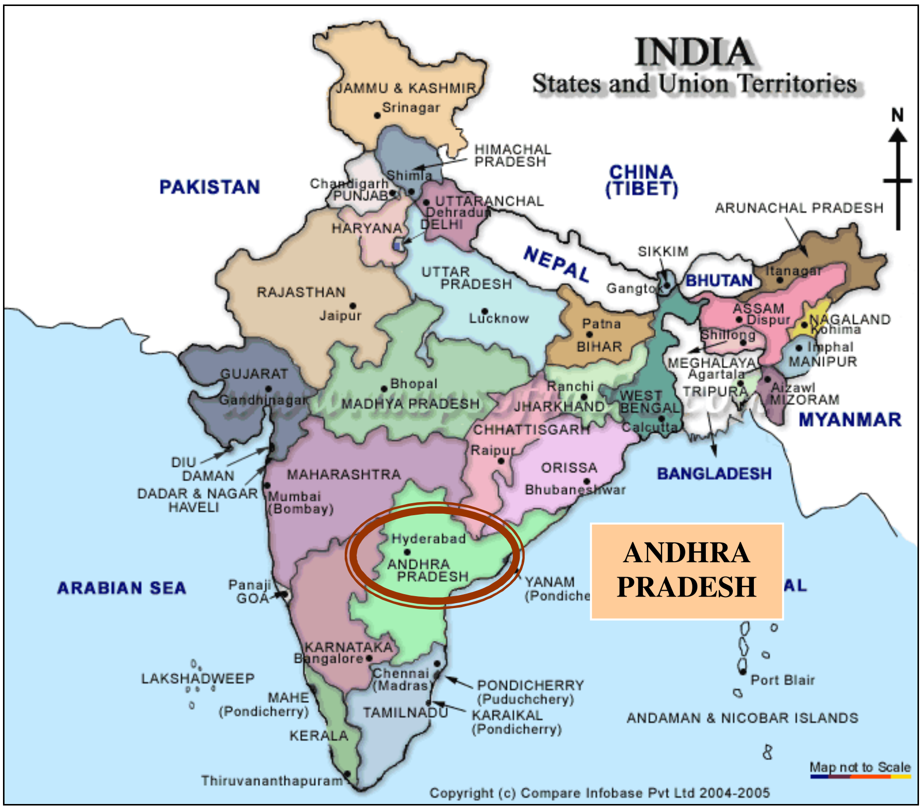
State: Andhra Pradesh

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 sugar complex of GMR Industries Ltd. at village Sankili of Srikakkulam District in Andhra Pradesh, India. The plant site is about 120 km from the nearest airport of Vishakhapattanam. And the nearest railway station is Amadalavalasa at 35 km. Sankili is at 18^0 35' 45" N Latitude and 83^0 40' 30" E Longitude. The geographic location in which the project activity is located is depicted in the map below:


INDIA
States and Union Territories
ANDHRA PRADESH
PAKISTAN
CHINA (TIBET)
NEPAL
BHUTAN
MYANMAR
BANGLADESH
ARABIAN SEA
JAMMU & KASHMIR
Srinagar
HIMACHAL PRADESH
Shimla
Chandigarh
PUNJAB
UTTARANCHAL
Dehradun
DELHI
HARYANA
RAJASTHAN
Jaipur
UTTAR PRADESH
Lucknow
GUJARAT
Gandhinagar
MADHYA PRADESH
Bhopal
BIHAR
Patna
JHARKHAND
Ranchi
WEST BENGAL
Calcutta
CHHATTISGARH
Raipur
ORISSA
Bhubaneshwar
MAHARASHTRA
Mumbai (Bombay)
Hyderabad
ANDHRA PRADESH
KARNATAKA
Bangalore
Chennai (Madras)
TAMILNADU
KERALA
Thiruvananthapuram
Panaji GOA
DIU
DAMAN
DADAR & NAGAR HAVELI
LAKSHADWEEP
MAHE (Pondicherry)
YANAM
PONDICHERRY (Puduchchery)
KARAIKAL (Pondicherry)
SIKKIM
Gangtok
ARUNACHAL PRADESH
Itanagar
ASSAM
Dispur
Shillong
MEGHALAYA
Agartala
TRIPURA
NAGALAND
Kohima
Imphal
MANIPUR
Aizawl
MIZORAM
Port Blair
ANDAMAN & NICOBAR ISLANDS
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Map not to Scale
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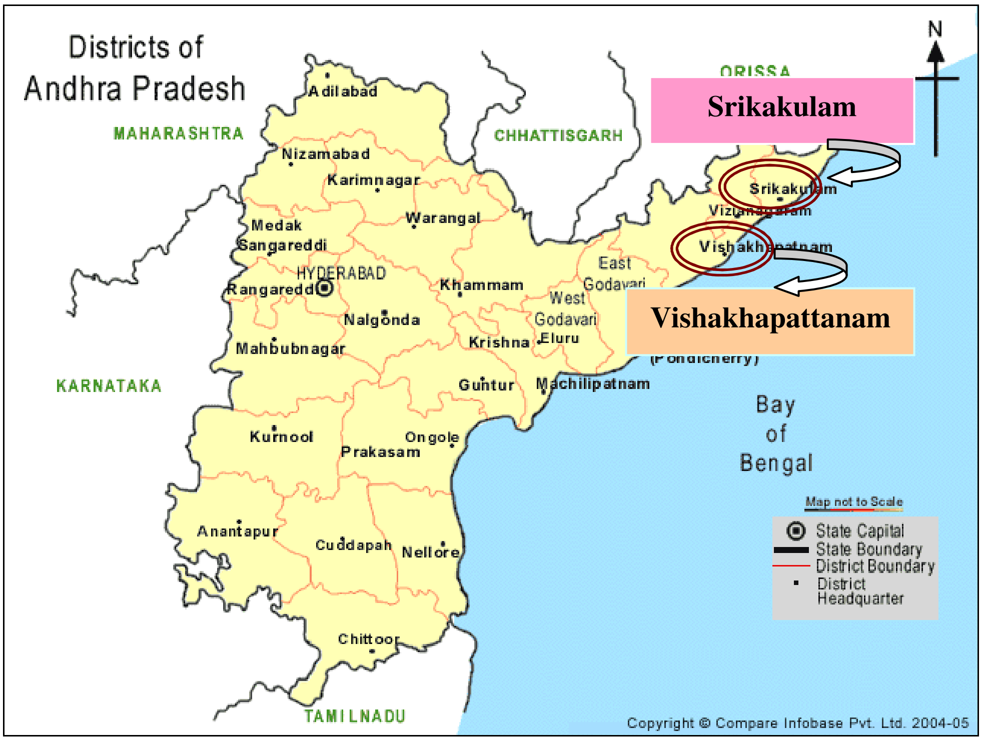
Districts of Andhra Pradesh
Srikakulam
Vishakhapattanam
MAHARASHTRA
CHHATTISGARH
ORISSA
KARNATAKA
TAMILNADU
Adilabad
Nizamabad
Karimnagar
Warangal
Medak
Sangareddi
HYDERABAD
Rangareddi
Khammam
Nalgonda
Mahbubnagar
Krishna
Eluru
West Godavari
East Godavari
Srikakulam
Vizianagaram
Vishakhapatnam
Guntur
Machilipatnam
Kurnool
Prakasam
Ongole
Anantapur
Cuddapah
Nellore
Chittoor
Bay of Bengal
N
Map not to Scale
State Capital
State Boundary
District Boundary
District Headquarter
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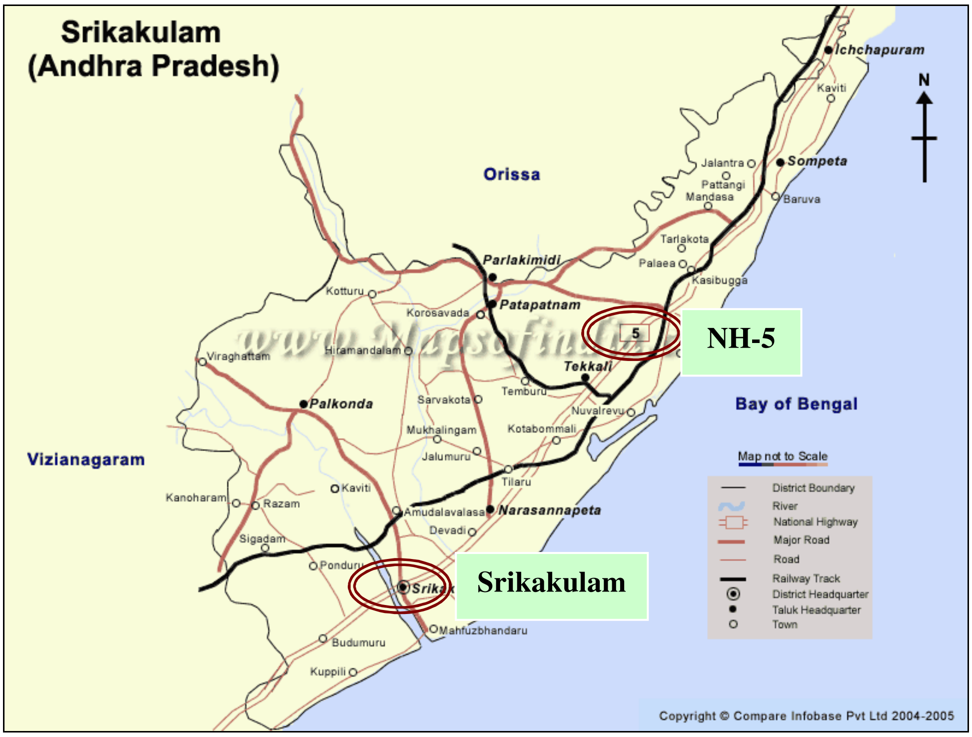

A.4.2. Type and category(ies) and technology of the small-scale project activity:

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 conforms to the following category-

TYPE II: Energy Efficiency Improvement Projects

Category C: Demand-side energy efficiency programmes for specific technologies

This category comprises programmes that encourage the adoption of energy-efficient equipment, lamps, ballasts, refrigerators, motors, fans, air conditioners, appliances, etc. at many sites. These technologies may replace existing equipment or be installed at new sites. The aggregate energy savings by a single project may not exceed the equivalent of 15 GWh per year.

Details of technology/ measures implemented by GIDL

Electricity Conservation Measures

A. Replacement of conventional motors with energy efficient motors
   High energy efficiency motors have replaced low efficiency motors in pumps and blowers. The new efficiency is ~92% as compared to old efficiency ~89%.

B. Replacement of several low capacity machines with single high capacity machine

Installation of Single “A” Batch Centrifugal (High Capacity): GIDL have replaced two 700 kg/ charge with one 1750 kg/ charge machine DC drive with re-generative breaking system.

Installation of Single “B” Continuous Centrifugal (High Capacity): Replacing 3 Nos. 1150 dia. Machines with one 1500 dia. Machine

C. Installation of Variable Speed Drives for Cane carrier, pumps, fans etc.
GIDL has installed VFDs on dyno-drive and pumps and fans in the plant as the load on machines change with changing flow rates. Other equipments such as rake elevator, inter rake carriers, Magma Pumps and Super heat wash-water pumps are also being equipped with VFDs.

D. Lighting system
All lighting systems require voltage level 210-215 V against the available level is 230-240 V. Introducing voltage controllers in the circuit voltage has been reduced to 210 V and that has resulted into electricity savings.

E. Operating motors on star connection instead of delta connection
Permanently under-loaded motors are converted from Delta connection permanently into Star connection. A reduction in voltage by a factor of $1/\sqrt{3}$ helps in optimized use of power.

F. Star delta controllers for fluctuating loads
Motors operating below 50% load with fluctuating loads have been installed with star-delta controllers to save power.

G. Other initiatives
   a. Planetary gears
   Conventional crystallizers of 15 HP have been replaced with 3 HP planetary gears.

   b. Rotary screen
   By repositioning the rotary screen could effect into removal of conveyors for carrying cush-cush to the rake carrier.

H. Installation of capacitor banks
This has helped in by improving MCC voltage and preventing power losses in cables from PCC to MCC.

Steam Conservation Measures

Steam conservation schemes were implemented at GIDL in two phases. Phase I was implemented during 2004-05 season when specific steam consumption reduced from 43.61% to 36.00%. Phase II came up in 2005-06 season and specific steam consumption was further reduced to 34.12%.

A. Rearrangement of evaporator bleeding

Rearrangement of sulphited juice heating

i. The norm in sugar industry is to have heating of sulphited juice in two stages i.e. 2nd vapor followed by 1st vapors in conventional tubular heater. GIDL has increased the stages from 2 to 3 in the project activity.

ii. The conventional tubular heater has been replaced with Dynamic/ Sweeping arrangement for heating 1st stage sulphited juice on 3rd effect vapors.
iii. DEVC-2 vapors are used for heating 2nd stage sulphited juice heating in tubular heaters.
iv. For 3rd and final heating of sulphited juice, DEVC-2 vapors are used in Direct Contact heater.

Utilization of noxious gases
The noxious gases in the steam vapor used at subsequent areas to recover waste heat in low pressure lines by connecting back to immediate low pressure vapor lines.

B. Improvement in seed melting
GIDL has made significant savings in steam consumption by taking measures which are executed at lower temperatures resulting into steam savings and capacity improvement.

C. Improvement in Pan boiling
The Pan Circulation intensity can be increased by increased temperature of heating media, lesser tube height and by jigger steam. GIDL has adopted the jiggler steam connection to increase the C-continuous pan circulation with batch pan NCG introduction.

D. Other measures
i. Lower temperature heating media for C-continuous vacuum pan
ii. Steam ejectors replacement by water ejectors
iii. Reduction in steam consumption at de-aerator by introducing PHE to increase the temperature of DM water and turbine condenser hot well condensate water with excess hot condensate.

E. Waste Heat Recovery from flue gases

Flue gas from Boiler chimney contains higher temperature. This waste heat is recovered by heat exchanger installed in the flue gas path for heating the condensate water, which undergoes multi stage flashing in evaporator set for collecting the vapours.

GIDL target to achieve further savings in steam consumption per unit of cane crushed and reach the level of 30% by continuously adopting technologies/ measures and backing it up with CDM benefits.

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:

Energy efficiency measures adopted have resulted in savings of electricity in the plant per tonne of cane crushing. These initiatives could help either improve the crushing capacity of the sugar plant or the additional power could be exported to the connected grid (Southern grid in the project activity). Southern Electricity Grid is primarily fossil fuel based and thus any electricity saving results into equivalent amount of emissions reduction from power generation.

The steam savings result in emission reductions from fossil fuel burning in steam generation in the cogeneration plant.

The project would not have happened without accounting for CDM benefits as it faces many barriers and is not a common practice. In the absence of the project activity the plant would have continued with the same levels of energy (electricity & steam) consumptions in the sugar plant.

The total of GHG emissions reduction from the project activity in tones of CO2 equivalent = 46492 tCO2e over the fixed crediting period of 10 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
Apr 06- Mar 07	4490
Apr 07- Mar 08	4490
Apr 08- Mar 09	4490
Apr 09- Mar 10	4635
Apr 10- Mar 11	4635
Apr 11- Mar 12	4635
Apr 12- Mar 13	4780
Apr 13- Mar 14	4780
Apr 14- Mar 15	4780
Apr 15- Mar 16	4780
Total estimated reductions (tonnes of CO2 e)	46492
Total number of crediting years	10 years Fixed
Annual average over the crediting period of estimated reductions (tonnes of CO2e)	4643

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

No public funding from Annex 1 countries for 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 GIDL, 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-

TYPE II: Energy efficiency improvement projects

Category IIC: Demand side energy efficiency programmes for specific technologies

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

Category	Applicability Criteria	Project Status
TYPE IIC : Demand-side energy efficiency programmes for specific technologies	This category comprises programmes that encourage the adoption of energy-efficient equipment, lamps, ballasts, refrigerators, motors, fans, air conditioners, appliances, etc. at many sites. These technologies may replace existing equipment or be installed at new sites.	The project activity entails installation of new equipments/ machines and replacement of old equipments at the site. The measures lead to electricity and steam savings.
	The aggregate energy savings by a single project may not exceed the equivalent of 15 GWh per year.	The aggregate saving from the project activity is ~ 8.0 GWh per year.

Important information for determination of baseline scenario:

SN	Baseline Key Information
1	Energy baseline both for electricity & steam consumption
2	Southern grid emission factor
3	Transmission and distribution losses for the southern grid
4	Fossil fuel consumption in steam generation

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 IIC– Demand-side energy efficiency programmes for specific technologies

- The project activity category comprises many energy efficiency measures implemented at many sites.
- The aggregate energy savings by project does not exceed the equivalent of 15 GWh per year.
- 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. Continue with existing energy consumption levels at the sugar plant.
2. Implementation of energy saving measures without CDM.

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

GIDL being a leading organization in the area of Sugar manufacture has taken up many energy efficiency projects in the previous years to improve on its energy consumptions etc. The organization has won many reputed awards for its significant contribution and initiatives to achieve economical and optimal Energy usage model. The company has won awards such as 'Best Sugar Factory in India, in Energy Conservation, for the year of 2005' and 'CII National Award for Excellence in Energy Management 2005'.

Barrier analysis is done on following aspects as described in the methodology.

Technological barrier

[1] Refer section A.4.5

The measures adopted by GIDL carry a number of technological barriers to their implementation. These are summarised as follows –

1. Replacement of low capacity machines with a single high capacity equipment
Sugar is a season based industry. They try to maximise their production and any downtime badly affects the productivity and profitability of the plant. Replacement of a number of smaller machines lead to energy savings but plant's dependence on single large machine increases and any shut-down/ break-down of the machine can significantly affect the production from the plant in the absence of the alternative.

2. Installation of variable frequency drives (VFD's)
VFDs are high end electro-mechanical devices, to optimize the power usage in accordance to load taken by equipment. These devices are sensitive to their environment condition and presence of moisture and particulate matter in air may cause damage to these systems. More over VFD's need long installations and testing periods in addition to problems like high noise and excessive motor heat.

3. Installation of energy efficient motors
Energy efficient motors due to high current inrush at starting are prone to tripping malfunctions during start-ups which can lead to production losses. The installation of energy efficient motors need high investment and increases the efficiency by 3-4% only, thereby increasing the inherent investment risk on part of project proponent.

4. Steam saving measures
M/s Spray Engineering Devices Ltd. (SEDL) have developed many technological innovations and equipments which could result in substantial steam savings in a sugar plant. But SEDL could not sell the idea to any sugar plant in India - due to the heavy investments involved and also due to the inexperience of the industry in going for such projects. The technology was new and SEDL faced a lot of problems convincing sugar industries. GIDL was the one to decide and move ahead with the technology. So, the implementation carried a number of barriers because the technology was new and there was no proven case available in the sugar industry.

Common Practices Analysis
GIDL's is the one of the first sugar plant to adopt energy efficiency projects of such kind in steam optimization. The norm of sugar industry for energy consumption is ~30 kWh per tonne of cane crushed and ~ 40% steam consumption. GIDL's has always strived to improve on its past performances. GIDL's current electricity consumption stands at ~24 kWh per tonne of cane crushed and steam consumptions are at 34.12% and further envisage bringing it down to 30% gradually. GIDL received excellence awards for energy management from CII (Confederation of Indian Industry) for the year in 2005 and from SISSTA (The Southern India Sugarcane & Sugar Technologists' Association) for 2004-05.

GIDL had undergone energy audits in the past by various agencies and had identified a number of possibilities for improving on energy consumptions in the plant. But the implementation of these measures required significant investments but the benefits from these measures were marginal. However as an environmentally conscious group and being a leader in the region, GIDL took up this initiative and back the activity up with CDM benefits.

GIDL has put in efforts in two areas one, electricity savings by retrofitting energy efficient equipments, installation of high capacity machines & others as listed in section A.4.2 of this document and two, by reducing steam consumption in the plant improving heat utilisation in process. GIDL in association with

SEDL have identified several steam saving measures. The total investment from GIDL on energy saving measures has been to the tune of Rs. 30 million (both for electricity conservation and steam savings).

Colloquially it can be quoted that investments required are not that immense, but due to technological, operational and first time usage of technology there is always an inherent Investment risk.

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. In the absence of the project activity GIDL would have continued with existing levels of energy consumptions.

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 sugar plant facility delineates the project boundary that includes locations of each measure (each piece of equipment) installed.

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:

25/10/ 2002

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

20 years

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

C.2.1. Renewable crediting period:

NA

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

C.2.1.2. Length of the first crediting period:

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/04/2006

C.2.2.2. Length:

10 years

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 category-

TYPE IIC: Demand-side energy efficiency programmes for specific technologies

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

If the devices installed replace existing devices, the number and "power" of the replaced devices shall be recorded and monitored.

Monitoring shall consist of monitoring either the "power" and "operating hours" or the "energy use" of the devices installed using an appropriate methodology. Possible methodologies include:

(a) Recording the "power" of the device installed (e.g., lamp or refrigerator) using nameplate data or bench tests of a sample of the units installed and metering a sample of the units installed for their operating hours using run time meters.

OR

(b) Metering the "energy use" of an appropriate sample of the devices installed. For technologies that represent fixed loads while operating, such as lamps, the sample can be small while for technologies that involve variable loads, such as air conditioners, the sample may need to be relatively large.

In either case, monitoring shall include annual checks of a sample of non-metered systems to ensure that they are still operating (other evidence of continuing operation, such as on-going rental/lease payments could be a substitute).

Published values for technical transmission and distribution losses may be used. Alternatively, technical transmission and distribution losses for the grid that supplies energy to the equipment installed may be monitored.

D.3 Data to be monitored:

ID number	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	Quantity of Cane crushed	TCD	M	Daily	100%	Electronic/ paper	Credit period+2 years	For estimation of sp. Steam consumption for cane crushed
2	Identification of sections where energy saving measures have been implemented	Text	M	Yearly	100%	Electronic/ paper	Credit period+2 years	
3	Power of the equipment replaced i	kW	M	Power data before replacement	100%	Electronic/ paper	Credit period+2 years	For determination of baseline energy consumptions
4	Running hours of equipment replaced i	Hrs/ annum	M	Daily	100%	Electronic/ paper	Credit period+2 years	For determination of baseline energy consumptions
5	Power of the equipment installed j	kW	M	Monthly	100%	Electronic/ paper	Credit period+2 years	For determination of energy consumptions in project activity
6	Running hours of equipment installed j	Hrs/ annum	M	Daily	100%	Electronic/ paper	Credit period+2 years	For determination of energy consumptions in project activity

7	Steam consumption	Tonnes	M	Daily	100%	Electronic/ paper	Credit period+2 years	For determination of energy consumptions in project activity
8	Steam Pr.	kg/cm2	M	Daily	100%	Electronic/ paper	Credit period+2 years	For determination of energy consumptions in project activity
9	Steam Temp.	Deg C	M	Daily	100%	Electronic/ paper	Credit period+2 years	For determination of energy consumptions in project activity
10	Quantity of fossil fuel i consumed in steam generation	Tonnes	M	Monthly	100%	Electronic/ paper	Credit period+2 years	For determination of fossil fuel saved
11	NCV of fossil fuel i	Kcal/kg	M	Monthly	100%	Electronic/ paper	Credit period+2 years	
12	Emission factor of fossil fuel i	tCO2e/TJ	E	Yearly	100%	Electronic/ paper	Credit period+2 years	IPCC default value
13	Boiler efficiency	%	M/E	Yearly	100%	Electronic/Paper	Credit period + 2	

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 1,2)	Low	No QA/ QC procedure required. The data is collected as part of plant operations
Table D.3 (ID numbers from 3-11,13)	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 12)	Low	No QA/ QC procedure required

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 Monitoring Plan

GIDL's Sugar Division is an ISO-900:2000 certified and it 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.

This CDM project activity is in the sugar manufacturing unit of the complex, headed by Mr. S. Srinivasa Rao, A.G.M. (Engg).

A CDM projects' monitoring committee 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 projects' monitoring committee members/managers. In case of any irregularity observed by any of the CDM projects' monitoring committee 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 Engg.:*** 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 projects' monitoring committee **personnel:**
The training of the CDM projects' monitoring committee 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 projects' monitoring committee 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 correctiveness if required an annual report on monitoring and estimations shall be maintained by the CDM projects' monitoring committee and record to this effect shall be maintained for verification.

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

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

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

E.1.1 Selected formulae as provided in appendix B:

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:

No emissions from the project activity.

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

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

Zero.

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:

Electricity Displacement:

Electricity Baseline

$E_B = \sum_i(n_i \, . \, p_i \, . \, O_i)/ \, (1 - l)$

E_B = annual energy baseline in kWh per year
$\sum_i$ = the sum over the group of "i" devices replaced (e.g. 40 W incandescent bulb, 5hp motor), for which the replacement is operating during the year, implemented as part of the project.
n_i = the number of devices of the group of "i" devices replaced (e.g. 40 W incandescent bulb, 5hp motor) for which the replacement is operating during the year.
p_i = the power of the devices of the group of "i" devices replaced (e.g. 40 W, 5 hp). In the case of a retrofit programme, "power" is the weighted average of the devices replaced. In the case of new installations, "power" is the weighted average of devices on the market.
O_i = the average annual operating hours of the devices of the group of "i" devices replaced.
l = average technical distribution losses for the grid serving the locations where the devices are installed, expressed as a fraction

Emission Factor
Emission factor for the southern grid has been estimated as per ACM0002, version 05, dated 03rd March 2006 as suggested. Details are attached in Annex 3 of this document.

The product of energy baseline and the grid emission factor gives the emission reduction due to electricity savings in the plant.

Steam optimization in process:

Production baseline

$$P_{rep} = \frac{(P_1 + P_2 \ldots . + P_n)}{n} \times A$$

where

$P_1, P_2, \ldots . P_n$	= Shift/ batch-wise production values for the baseline
P_{rep}	= Representative production for the day
A	= number of shifts/day for continuous processes (shift-wise monitoring)
A	= number of batches/day for batch processes (batch-wise monitoring)

Steam consumption baseline

$$S_{rep} = \frac{(S_1 + S_2 ..... + S_n)}{n} \times A$$

where

$S_1, S_2, ...S_n$	= Shift/ batch-wise steam consumption values for baseline, corresponding to $P_1, ...P_n$
S_{rep}	= Representative steam consumption for the day, corresponding to P_{rep}
A	= number of shifts/day for continuous processes (shift-wise monitoring)
A	= number of batches/day for batch processes (batch-wise monitoring)

Baseline Sp. Steam Consumption Ratio

$$SSCR = \frac{S_{rep}}{P_{rep}}$$

where

SSCR	= Specific Steam Consumption Ratio in the baseline
S_{rep}	= Representative steam consumption for the day/batch
P_{rep}	= Representative production for the day/batch

Project activity production

$$P_{rep1} = \frac{(P_1 + P_2 ..... + P_m)}{m} xA$$

where

P_{rep1}	= Representative production for the day
$P_1, P_2, ...P_m$	= Shift/ batch-wise production values for project scenario
A	= number of shifts/day for continuous processes (shift-wise monitoring)
A	= number of batches/day for batch processes (batch-wise monitoring)

Project activity steam consumption

$$S_{rep1} = \frac{(S_1 + S_2 ...... + S_z)}{z} xA$$

where

$S_1, S_2, ...S_m$	= Shift/ batch-wise steam consumption values for project, corresponding to $P_1, ...P_m$
S_{rep1}	= Representative steam consumption for the day (corresponding to P_{rep1})
A	= number of shifts/day for continuous processes (shift-wise monitoring)
A	= number of batches/day for batch processes (batch-wise monitoring)

<u>Project Activity Sp. Steam Consumption Ratio</u>

$$SSCR_1 = \frac{S_{rep1}}{P_{rep1}}$$

where

$SSCR_1$	= Specific Steam Consumption Ratio for the project activity
S_{rep1}	= Representative steam consumption for the day (corresponding to P_{rep1})
P_{rep1}	= Representative production for the day

<u>Difference in SSCR of baseline and project activity</u>

$$SSCR_{diff} = SSCR - SSCR_1$$

where

$SSCR_{diff}$	= difference in SSCR of baseline and project scenarios
SSCR	= Specific Steam Consumption Ratio in the baseline
$SSCR_1$	= Specific Steam Consumption Ratio for the project activity

<u>Net daily reduction in steam consumption</u>

$$S_{net} = SSCR_{diff} \ x \ P_{act}$$

where

S_{net} = Net reduction in steam consumption per day (kg/day)
$SSCR_{diff}$ = difference in SSCR of baseline and project scenarios
P_{act} = Actual value of output on the day.

Net daily reduction in energy due to reduction in steam consumption

$$E_{net} = S_{net} \ x \ E_s$$

E_{net} = Net reduction in steam energy consumption per day (kCal/day)
S_{net} = Net reduction in steam consumption per day (kg/day)
E_s = Net enthalpy of steam being supplied in boiler (kCal/kg). (To be monitored)

and

$$E_s = E_{tot} - E_{fw}$$

where

E_s = Net enthalpy of steam being supplied in boiler (kCal/kg). (To be monitored)
E_{tot} = Total enthalpy of steam at the boiler outlet (kCal/kg)
E_{fw} = Heat content of feed water (kCal/kg)

Daily reduction in input energy in boiler

$$E_{in} = E_{net} / \eta_b$$

where

E_{in} = Energy input in boiler
E_{net} = Net reduction in steam energy consumption per day (kCal/day)
η_b = Efficiency of boiler, to be monitored periodically by direct or indirect method.

Estimation of CO2 emission reductions in the boiler per day

$$C_{er} = E_{in}\ x\ \sum(F_{fuel} x \% H_{fuel})$$

where

C_{er} = CO_2 emission reductions in the boiler per day
E_{in} = Energy input in boiler
F_{fuel} = Carbon emission factor for fuel to be taken based on actual laboratory tests
$\%H_{fuel}$ = % of hours per day for each type of fuel. (To be monitored)

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	Emission reduction due to electricity savings	Emissions reduction due to steam savings	Leakage	Net Emissions Reduction
	tCO2/yr	tCO2/yr	tCO2/ yr	tCO2/yr
2006-07	2805	1685	0	4490
2007-08	2805	1685	0	4490
2008-09	2805	1685	0	4490
2009-10	2805	1830	0	4635
2010-11	2805	1830	0	4635
2011-12	2805	1830	0	4635
2012-13	2805	1975	0	4780
2013-14	2805	1975	0	4780
2014-15	2805	1975	0	4780
2015-16	2805	1975	0	4780

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

Year	Emission reduction due to electricity savings	Emissions reduction due to steam savings	Emissions Reduction
	tCO2/yr	tCO2/yr	tCO2/yr
2006-07	2805	1685	4490
2007-08	2805	1685	4490
2008-09	2805	1685	4490
2009-10	2805	1830	4635
2010-11	2805	1830	4635

2011-12	2805	1830	4635
2012-13	2805	1975	4780
2013-14	2805	1975	4780
2014-15	2805	1975	4780
2015-16	2805	1975	4780

SECTION F.: Environmental impacts:

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

The project activity does not require environment impact study to be undertaken as per pollution control regulations in India.

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 at 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 issues.

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 the environment.

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
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City:	Mandal Regidi, Srikakulam District
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Represented by:	
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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 03rd 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.

If the 20% falls on the part capacity of a plant, that plant has fully included in the calculation

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

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
SREB	Southern Region Electricity Board
OM	Operating Margin
BM	Build Margin
CM	Combined Margin