CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02 - in effect as of: 1 July 2004)

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

"16 MW Bagasse based cogeneration plant" by GMR Industries Ltd. (GIDL)
Version: 2.0
Date: 10.07.2006

A.2. Description of the 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 GMR group. The plant is ISO-9001 certified.

The sugar complex of the GMR Industries Ltd. has a sugar plant and a cogeneration plant within the same complex. The crushing capacity of the sugar plant is 3,125 tonnes per day and the capacity of the cogeneration plant is 16 MW. The cogeneration unit is connected to the grid and supplies excess power to the grid via APTRANSCO transmission lines as per the PPA and Tariff Order of APERC (Andhra Pradesh Electricity Regulatory Commission). The cogeneration plant uses bagasse as fuel during season and other biomass products such as jute sticks, cotton stems, cane thrash, groundnut shells, as fuel in off season along with some coal co-fired. The plant is based on conventional steam-power cycle. It consists of two boilers of 35 TPH each at 46 ATA and 420 Deg C and one double extraction-condensing steam turbine of 16 MW.

Bagasse in sugar plant is a left over from crushed cane after the juice extraction and is approximately ~28% of the cane crushed in the plant. This quantum of bagasse is good enough to meet the in-house demand of steam and power during season and possibly generate extra power by using more renewable fuels purchased from markets which can be supplied to the state grid. The cogeneration plants were not allowed to sell the extra power to third party users at the time of conceptualization of the project activity and selling it to the grid had a number of risks such as poor pricing policy, arbitrary PLF policies, grid related operational problems, legislative constraints and other regulatory barriers.

GIDL has come up with the project activity despite the barriers because of the positive impact it made on the environment and people in general, in and around the region. GIDL decided on the project activity taking into account the benefits coming from the CDM revenue.

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

Social wellbeing:
The project activity has resulted into employment generation both during the erection/ commissioning of the plant and later on in the operation/ maintenance of the unit. GIDL in the project activity is using in-house generated bagasse during season and other biomass residues bought out from outside during off-season. This has created a distinct source of revenue generation to the rural populace.

Environmental wellbeing:
The project activity has resulted into substantial GHG emission reduction and has also helped in environment conservation by avoiding burning of biomass residues in open fields. (Farmers in general burn the biomass residues in the open fields to clear the field for the next crop.) Conservation of natural

resources like coal & fuel oil could also be achieved by the project activity helping to some extent in the energy security of the nation.

Economic wellbeing:
The project activity shall provide the required impetus for similar industries to come up with cogeneration units exporting surplus power to the grid and bring in required investments to the region. This will lead to infrastructure development in all dependant areas as well as push to economic activity in the region/ country. As, many people are roped in the value chain of this particular project, so each one will get their share of earnings.

Technological wellbeing:
The technology in the project uses the proven and safe steam-power cycle for power and steam generation. An increase in such kind of projects shall enable all the technology suppliers to continuously innovate and modernise on technology front.

GIDL has always been conscious of its social responsibilities and has undertaken a number of initiatives to help society in general.

The Sugar Complex has crossed many mile-stones in the areas of Sugar Cane development Industrial Performance and Energy Conservation.

- 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 in progress.
- 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	GMR Industries Ltd. (GIDL)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

India

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

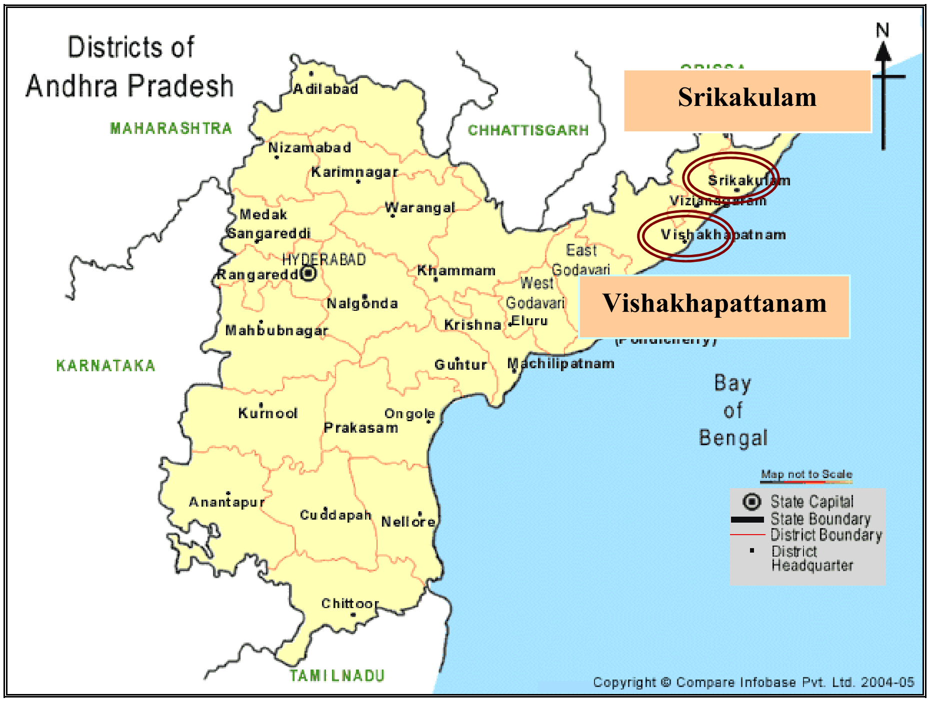
State of Andhra Pradesh

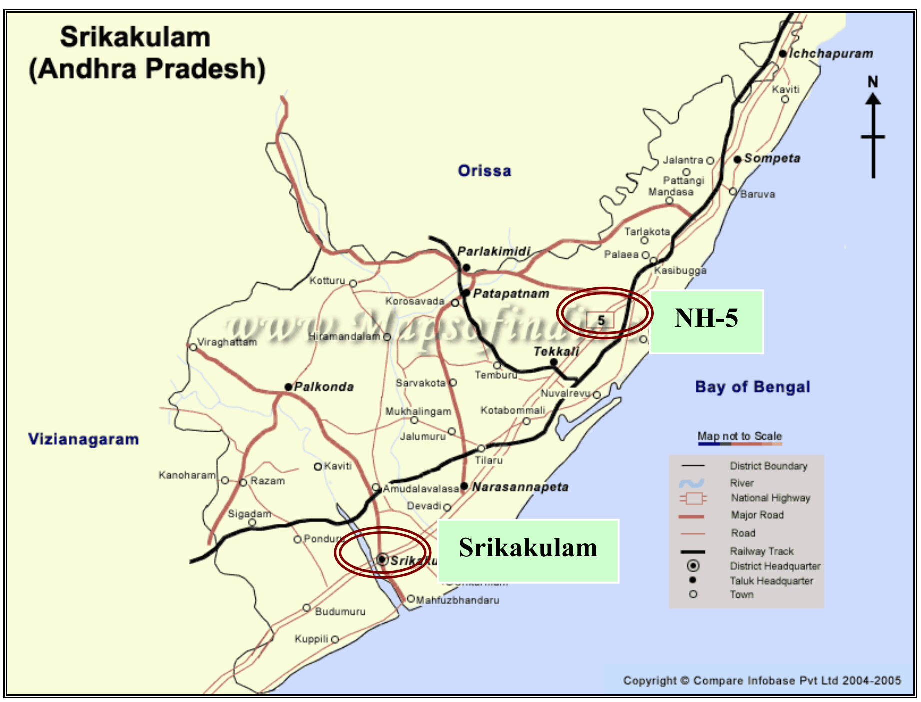
A.4.1.3. City/Town/Community etc:

Village : Sankili
Mandal : Regidi
District : Srikakulam

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

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 142 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:





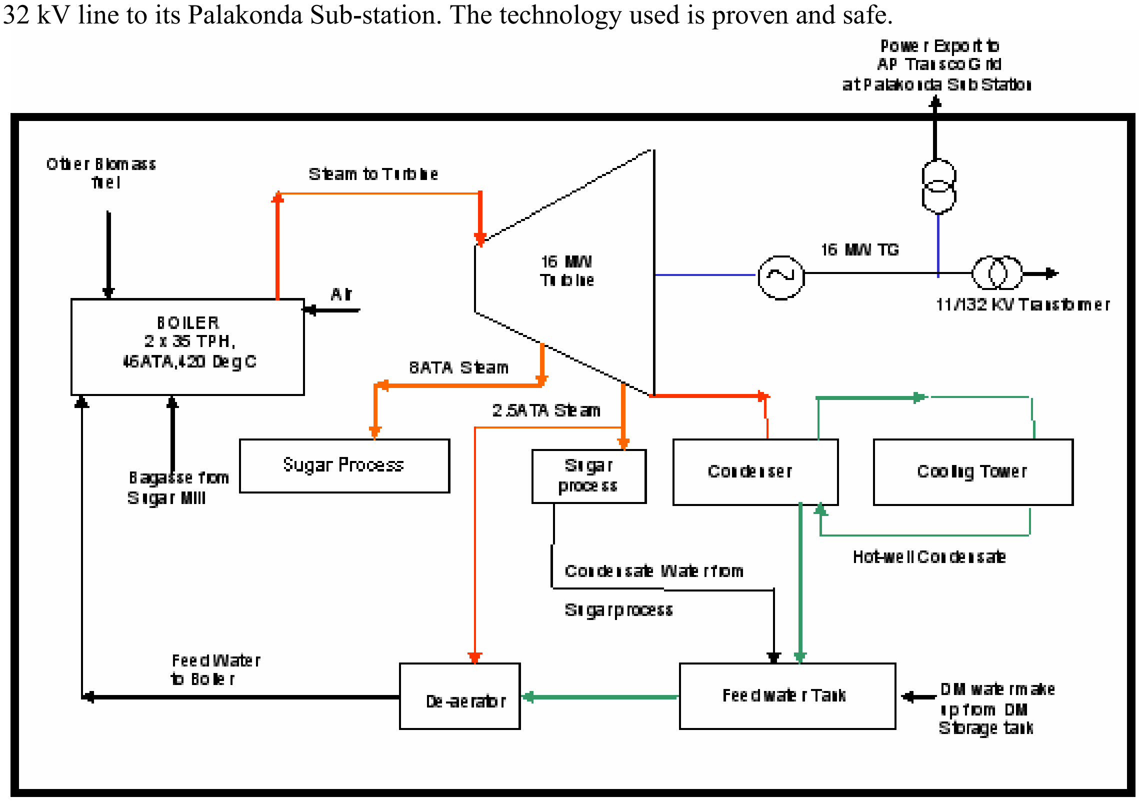
A.4.2. Category(ies) of project activity:

Approved consolidated baseline methodology **ACM0006 "Consolidated baseline methodology for grid-connected electricity generation from biomass residues".**

Reference: ACM0006, Version 03, Sectoral Scope 01, dated 19th May 2006

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

The cogeneration plant in the project activity is based on conventional steam-power cycle. This comprises of two boilers of 35TPH capacity at 46 ATA and 420 Deg C. The turbine is a double extraction-condensing turbine of 16 MW. The steam extracted from the turbine is used in sugar plant processes and power generated is both used in-house and excess exported to APTRANSCO grid (APTRANSCO) via a 132 kV line to its Palakonda Sub-station. The technology used is proven and safe.



A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

The project activity results into emission reduction through substitution of power by energy generation with renewable fuels like, bagasse generated in-house and other biomass residues bought out from the market. The substituted power in this case is Andhra Pradesh grid electricity connected to southern regional grid, which is primarily based on fossil fuel combustion. Substitution of grid power would result in emission reduction associated with the fossil fuels burning for this power generation. In the absence of

project activity GIDL would have continued to meet its steam & power demand by the existing bagasse based boiler and a 2 X 3 MW turbines and would not have generated and exported any electrical power to the southern grid via APTRANSCO in the project activity.

At the time when the project activity of GIDL came into operation, there were not many sugar plants in Andhra Pradesh which have cogeneration units exporting power to the state grid due to the risks (details are provided in additionality argument of this document) involved. GIDL has come up with the project activity despite the barriers that existed because of the positive impact it would make on the environment and people in general, in and around the region and back it up with CDM benefits.

The estimated amount of emissions reduction over the 7 years of first crediting period is : 281275 tonnes of CO_2 equivalent.

A.4.4.1. Estimated amount of emission reductions over the chosen crediting period:

Years	Annual estimation of emission reductions in tones of CO2 e
Oct 06- Sep 07	40182
Oct 07- Sep 08	40182
Oct 08- Sep 09	40182
Oct 09- Sep 10	40182
Oct 10- Sep 11	40182
Oct 11- Sep 12	40182
Oct 12- Sep 13	40182
Total estimated reductions (tonnes of CO2 e**)**	281275
Total number of crediting years	7 years renewable crediting period (Total 21 years)
Annual average over the crediting period of estimated reductions (tonnes of CO2e**)**	40182

A.4.5. Public funding of the project activity:

No public funding for the project activity.

SECTION B. Application of a baseline methodology

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

The project activity conforms to Approved consolidated baseline methodology **ACM0006 "Consolidated baseline methodology for grid-connected electricity generation from biomass residues".**
Reference: ACM0006, Version 03, Sectoral Scope 1, dated 19th May 2006

B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

Methodology	Applicability Criteria	Project Status

Approved Consolidated methodology ACM0006; **“**Consolidated baseline methodology for grid connected electricity generation from biomass residues”	This consolidated methodology covers a number of different project types for power generation with biomass residues. This methodology is applicable to grid-connected and *biomass residue* fired electricity generation project activities, including cogeneration plants.	This is a cogeneration plant with bagasse and other biomass residues as fuel into it and the plant is grid-connected.
	The project activity may be based on the operation of a power generation unit located in an agro-industrial plant generating the biomass residues or as an independent plant supplied by biomass residues coming from the nearby area or a market.	The project activity is in a sugar complex generating bagasse from the cane crushing process. The project activity makes use of this bagasse as a fuel for power generation. Also, GIDL buy other biomass residues from the nearby areas to run the cogeneration plant.
	No other biomass types than *biomass residues*, as defined above, are used in the project plant and these biomass residues are the predominant fuel used in the project plant (some fossil fuels may be co-fired);	Bagasse and other biomass residues are used in the project with some coal being co-fired.
	For projects that use biomass residues from a production process (e.g. production of sugar or wood panel boards), the implementation of the project shall not result in an increase of the processing capacity of raw input (e.g. sugar, rice, logs, etc.) or in other substantial changes (e.g. product change) in this process;	The project activity does not result into increase in processing capacity or any substantial change in the process.
	The biomass used by the project facility should not be stored for more than one year	Bagasse used in the project would be generated in-house and consumed immediately during the cane crushing season which is nearly 6 months. Other biomass residues are bought out from market for off-season requirement. The retention period is always less than a year.
	No significant energy quantities, except from transportation of the biomass, are required to prepare the biomass residues for fuel combustion, i.e. projects that process the biomass residues prior to combustion (e.g. esterification of waste oils) are not eligible under this methodology.	No such measure is required for preparing bagasse before its combustion in the boilers. Same is the case with the purchased biomass residues.

B.2. Description of how the methodology is applied in the context of the project activity:

The project activity is based on consolidated methodology ACM0006 "Consolidated Baseline Methodology for Grid-connected electricity generation from biomass residues". Following is the step-wise detail for determining baseline scenario for the project activity.

As per the methodology realistic and credible alternatives should be separately determined regarding:

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

Status of the project activity:
In the absence of the project activity GIDL would have continued with power generation in its existing cogeneration plant with no power export to the grid. The heat generation would have been by burning bagasse into existing boilers.

As per the Table 1 in the methodology ACM0006, Scenario 12 is the baseline scenario for the project activity from GIDL.

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 CDM project activity:

The additionality of the project activity is shown by using the "*Tool for Demonstration and Assessment of additionality"*, version 2, dated 28th November 2005.

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

The start date of project activity was 13th February 2000. The cogeneration plant started on 14th August 2001. Prior to the project activity GIDL was generating steam in the existing boilers for meeting its thermal energy demand. It was also operating 2X3 MW cogeneration plant solely to meet the in-house electrical energy requirement. In the absence of the CDM project activity the project proponent would have continued with the existing set up and no power would have been exported to the state grid. The evidence of consideration of CDM benefits from the time of conceptualization, and the continued effort made by the management to get CDM benefits right from the project start date would be shown to the DOE during validation.

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

Sub-step 1a: Define alternatives to the project activity
Following are the plausible alternatives available to the project proponent before the project activity was adopted –

1. Continuation of the current situation, wherein GIDL would have continued to generate steam in existing boiler to meet thermal energy requirement and 2 X 3 MW cogeneration plant for meeting its in-house electricity demand and power is not exported to the grid.
2. The proposed project activity not undertaken as a CDM project activity;

Sub-step 1b: Enforcement of applicable laws and regulations

Both the alternatives listed as above are well in line with the regulatory requirements of the state and central authority in India and neither of the two is prohibited from the rules and regulations prevailing. Thus, both the alternatives qualify for the next step of the tool.

Step 2: Investment Analysis

At this step it has been determined whether the project activity is economically or financially viable and attractive without the sale of Certified Emissions Reduction (CER).

Sub Step 2a- Determining appropriate analysis method

Project developer has chosen to apply Benchmark Analysis and has taken Required Rate of Return (RRR) as benchmark.

Sub Step 2b- Applying the selected analysis method

The project activity entails high capital cost investments. An investment analysis of the project activity was done based on the Internal Rate of Return as the financial indicator. 'IRR' is one of the known financial indicators used by banks, financial institutions and project developers for making investment decisions. The equity IRR was then compared with RRR[1] for the project activity.

Sub Step 2c- Calculation and comparison of financial indicators

The project activity is highly investment intensive. The total investment made by GIDL on the Cogeneration project implementation was INR ~37.43 Crores at the time of conceptualization. The plant's requirement for power generation could have been met by the existing 2 X 3 MW unit but GIDL decided to come up with the CDM project activity and export the excess power to the grid. The prices of power from the grid are also always prone to arbitrary changes from the board as proven by the recent decision of the electricity board to bring the prices down by 11% per unit of exported power. Similarly the PLF of the plant was restricted from 90% to 55% by the monopoly power buyer, APTRANCSO. The financial analysis shows that IRR for the project activity was ~12% at 85% Plant Load Factor (PLF) and with a change in power price and PLF, it goes even below that mark. So project activity could not have been possible if CDM benefits were not taken into account, which makes IRR of the project activity viable.

[1] The RRR (15%) was calculated as Required Rate of Return for the project activity. Capital asset pricing model (CAPM) is used

Summary of Financial analysis of project	
Capacity	16 MW
Project Cost	374.3 Million INR
Debt Equity Ratio	3
Interest Rate on term loan	14.5% (Wt average cost of debt)
Plant load factor	85%
Captive Consumption/Export Ratio	35%
Project IRR without CERs	12.0%
Project IRR with CERs	16.4%
Required Rate of Return on Equity	15.0%

Sub Step 2d- Sensitivity Analysis

A detailed sensitivity analysis of the project activity was done to test the project feasibility with varying project parameters. The project activity feasibility is dependent on the following parameters.

- Annual export to APTRANCSO
- Tariff paid by APTRANCSO

Sensitivity Table showing impact of variations in key factors on IRR without CDM revenue:

(a) Variation in Annual Export of power-

SN	Parameters	Variation	IRR	% Change	Comments
1	Annual Export to APTRANCSO	+10%	17.1%	+42%	*The probability of a 10% increase in annual export to APTRANSCO is not very high as PLF considered for IRR estimation is anyways 85%*
		-10%	7.1%	- 41%	The IRR of the project activity is very low in comparison of RRR benchmark. This was a very high probability case. The factors determining PLF are two, technical issues, and PLF cap suggested by *APTRANSCO.* The PLF of the plant was restricted from 90% to 55% by the monopoly power buyer, APTRANCSO

(b) Variation in Power Tariff-

SN	Parameters	Variation	IRR	% Change	Comments
2	Power Tariff paid by	+5%	17.85%	+ 49%	

	APTRANCSO	-5%	6.4%	- 47%	The IRR of the project activity is lower than the RRR benchmark; It has been seen in the past that tariff has been arbitrary lowered by APERC.

Conclusion:
Following various sub steps in Step 2 it has been well established and demonstrated that project activity is not a financially attractive option even if all key assumptions on the basis of which IRR has been calculated are changed in both directions and is thus additional.

As in Step 2 it has been concluded that proposed project activity is unlikely to be the most financially attractive now various barriers faced by the project have been summarized under step 3.

Step 3: Barrier Analysis

Investment barriers

Investments required for a cogeneration plant is quite sizable. GIDL is primarily into sugar manufacturing and power generation is not its core business activity. Sugar industry is a highly competitive market which is witnessing high growth cycle for past many years and thus always needs investments to grow and expand. The Cogeneration project cost at the time of project conceptualisation was ~37 Crores. This included investments in plant and machinery in the power generation plant, civil costs, design & engineering, start-up and training expenses, land and development costs, cost of transmission lines from the plant to sub-station and a switchyard and others.

On account of several barriers to this project regular bankers were unwilling to fund the project. Finally IREDA (Indian Renewable Energy Development Agency), an autonomous "Public Financial Institution" created by the MNES (Ministry of Non-Conventional Energy Sources, Government of India) came forward to fund the project.

Other barriers
Regulatory risks
GIDL exports power to APTRANSCO by a Power Purchase Agreement (PPA) with Andhra Pradesh Electricity Regulatory Commission (APERC) through 132 kV transmission lines of APTRANSCO to its substation at Palakonda. In India power selling arrangement with the grid always are prone to changes due to arbitrary decision making by the authorities. In the year 2004, APERC came up with a two tier tariff policy i.e. fixed rates and variable rates for power purchase from bagasse based cogeneration plants. According to this, upto 55% PLF, plants would be paid both fixed as well as variable part of the price, while beyond that cap only variable part of tariff would be paid. At the time of project start this kind of structure was not in place. GIDL has been running its cogeneration plant beyond 85% PLF. The structure to couple tariff rates with PLF has further jeopardised the viability of project. In 2001 the tariff for power sale was at Rs. 3.16 per unit, which has come down to Rs. 2.84 per unit in 2005-06 upto 55% PLF and at Rs. 1.07 per unit beyond 55% PLF with an incentive rate of Rs. 0.22per unit. This means that plant could not be operated at high capacity even if it is available for operations. This has led to complete deterioration in financial performance of the cogeneration plant.

Problems related to grid

Parallel operation of power generating unit with the grid always is problem area and needs additional support for operation & control to maintain the quality, safety, reliability and integrity of the unit with the grid. As no proper evacuation infrastructure was available, GIDL had also invested in installation of a 132 kV transmission line to evacuate power and supply it to the sub-station at Palakonda at a distance of 6 km from the sugar complex.

Availability of biomass residue
The region where the project activity is located is an agriculture rich region and there is enough biomass residues generated in the area to run this cogeneration plant. But the crops-yield depends heavily on rain during season and thus availability of biomass residue carry an inherent risk which is beyond the control of project proponent. Also, the cogeneration plant is operated using biomass residues purchased from the market and there was a need to create a sustainable network for the management of Biomass procurement and transportation to the cogeneration plant from all across the region.

Prices of biomass residues
The cost of biomass residues in the market is prone to changes based on the crop production and procurement infrastructure. In normal practice it is burned inefficiently or is left to rot in the field. Also it has also been observed that biomass prices increase significantly as bio-mass is used increasingly demand in bio-mass based power plants in the region. This happens due to lack of proper collection mechanism and delivery of biomass. This leads to short-term shortage and thus increased prices. The cost further includes the cost of collection and transportation to the cogeneration plant.

All these barriers as described above pose many obstacles for such project activity to happen and hence it is not a business-as-usual scenario.

Step 4: Common Practice

As per the information available from Ministry of Non-Conventional Energy Sources (MNES) in India for 2001-02, the total potential of cogeneration power generation was at 3,500 MW while the installed capacity of bagasse based cogeneration plants was 226 MW across India only. As many as 38 projects contributed to this capacity generation on an average of 5.9MW per plant. This is an indication that not many plants have been exporting power to the grid and were generating power for meeting their in-house demand.

Step 5: Impact of CDM registration

The project activity was initiated after considering CDM benefits. The benefits would take care of the many risks involved as described above. The registration of project activity would also attract other industries to take up and implement such projects, which will lead to further GHG emissions reduction.

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

As per the Approved Consolidated Methodology ACM0006; for the purpose of determining GHG emissions of the **project activity**, project participants shall include the following emissions sources:

- CO2 emissions from on-site fuel consumption of fossil fuels, co-fired in the biomass power plant; and
- CO2 emissions from off-site transportation of biomass that is combusted in the project plant.

For the purpose of determining the **baseline**, project participants shall include the following emission sources:

- CO_2 emissions from fossil fuel fired power plants connected to the electricity system; and
- CO_2 emissions from fossil fuel based heat generation that is displaced through the project activity.

The spatial extent of the project boundary encompasses the power plant at the project site, the means for transportation of biomass to the project site (e.g. vehicles), and all power plants connected physically to the electricity system that the CDM project power plant is connected to. The spatial extent of the project electricity system, including issues related to the calculation of the build margin (BM) and operating margin (OM), is further defined in the "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002) version 05, dated 03 March 2006.

Following table illustrates which emissions sources are included and which are excluded from the project boundary for determination of both baseline and project emissions.

Emissions	Source	Gas		Justification/ explanation
Baseline Emissions	Grid electricity generation	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Heat generation	CO_2	Excluded	As suggested in the methodology
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Uncontrolled burning or decay of surplus biomass	CO_2	Included	Does not apply to the project activity.
		CH_4	Excluded	
		N_2O	Excluded	
Project Emissions	On-site fossil fuel consumption due to project activity	CO_2	Included	An important emission source
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	Off-site transportation of biomass	CO_2	Included	Important emission source
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	Combustion of biomass for electricity and / or heat generation	CO_2	Included	Does not apply to the project activity.
		CH_4	Excluded	
		N_2O	Excluded	
	Biomass storage	CO_2	Excluded	Excluded as the storage period is less than a year
		CH_4	Excluded	
		N_2O	Excluded	

B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:

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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)
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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 project activity:

C.1.1. Starting date of the project activity:

13/02/2000

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

25 years

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

C.2.1. Renewable crediting period

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

01/10/2006

C.2.1.2. Length of the first crediting period:

7 years (twice renewable, total 21 years)

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
NA

C.2.2.2. Length:

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NA

SECTION D. Application of a monitoring methodology and plan

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

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The project activity conforms to Approved consolidated monitoring methodology **ACM0006 "Consolidated monitoring methodology for grid-connected electricity generation from biomass residues".**

Reference: ACM0006, Version 03, Sectoral Scope 01, dated 19th May 2006

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

This monitoring methodology shall be used in conjunction with the approved consolidated baseline methodology ACM0006 (Consolidated baseline methodology for grid-connected electricity generation from biomass residues). The same applicability conditions as in baseline ACM0006 apply.

Methodology	Monitoring Requirement	Project Status
Approved Consolidated monitoring methodology ACM0006; **"**Consolidated monitoring methodology for grid connected electricity generation from biomass residues"	Electricity generation from the proposed project activity;	Plant data on power generation is recorded as part of plant operations.
	Data needed to recalculate the operating margin emission factor, if needed, based on the choice of the method to determine the operating margin (OM), consistent with "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002);	The plant is exporting power to APTRANSCO which is part of Southern Regional Grid. OM for Southern Region Grid is estimated as per ACM0002, version 05, dated 03 March 2006.
	Data needed to recalculate the build margin emission factor, if needed, consistent with "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002);	The plant is exporting power to APTRANSCO which is part of Southern Regional Grid. BM for Southern Region Grid is estimated as per ACM0002 version 05, dated 03 March 2006. .
	Data needed to calculate, if applicable, carbon dioxide emissions from fuel combustion due to fossil fuels used in the project plant or in boilers operated next to the project plant or in boilers used in the absence of the project activity;	Project activity uses some fossil fuel as auxiliary fuel and emissions due to its burning are considered.
	Where applicable, data needed to calculate methane emissions from natural decay or burning of biomass in the absence of the project activity;	This is not considered in the project activity. This is more conservative.

	Where applicable, data needed to calculate carbon dioxide emissions from the transportation of biomass to the project plant;	These emissions due to transportation are included.
	Where applicable, data needed to calculate methane emissions from the combustion of biomass in the project plant;	Does not apply to the project activity.
	Where applicable, data needed to calculate leakage effects from fossil fuel consumption outside the project boundary;	Not considered as per the guidelines in methodology ACM0006 for scenario 12 applied to project activity.

D.2. 1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

D. 2.2. Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).

D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1.	*$BF_{i,y}$, Quantity of biomass type i combusted in the project plant during year y*	*Plant source*	*Tonne*	*e*	*Daily*	*100%*	paper	
2.	*AVD_y, Average return trip distance between biomass fuel supply sources and the project activity site*	*Plant data/ truckers data*	*Km*	*e*	*Yearly*	*100%*	paper	
3.	*N_y, Number of truck trips for the transportation*	*Plant data/ truckers data*	-	*e*	*Daily*	*100%*	paper	
4.	*TL_y, Average truck load of the trucks used for transportation of biomass*	*Plant data/ truckers data*	*Tonne*	*m*	*Daily*	*100%*	paper	
5.	*$EF_{km,co2}$, Average CO2 emission factor for transportation of biomass with trucks*	*Plant data/ truckers data/ IPCC*	*tCO2e/ km*	*c*	*Yearly*	*100%*	paper	

		default values						
6.	*$FF_{project plant,i,y}$, On-site fossil fuel consumption of fuel type i for co-firing in the project plant*	*Plant data*	*Tonne*	*m*	*Daily*	*100%*	paper	
7.	*$COEF_{CO2,i}$, CO2 emission factor of the fuel type i*	*Plant Data*	*tCO2e/ Tonne*	*c*	*Yearly*	*100%*	paper	
8.	*EGproject plant,y, Net quantity of electricity generated in the project plant during the year y*	*Plant data*	*kWh*	*m*	*Daily*	*100%*	Electronic/ paper	
9.	*Net Power export to the grid*	*Plant Data*	*kWh*	*m*	*Daily*	*100%*	Electronic/paper	

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

The project activity mainly reduces CO_2 emissions through substitution of power generation with fossil fuels by that from biomass residues. The emission reduction ER_y by the project activity during a given year y is the difference between the emission reductions through substitution of electricity generation with fossil fuels ($ER_{electricity,y}$), the emission reductions through substitution of heat generation with fossil fuels ($ER_{heat,y}$), project emissions (PE_y), emissions due to leakage (L_y) and, where this emission source is included in the project boundary and relevant, baseline emissions due to the natural decay or burning of anthropogenic sources of biomass ($BE_{biomass,y}$), as follows:

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

$$PE_y = PET_y + PEFF_{CO2,y} + GWP_{CH4} \cdot PE_{Biomass,CH4,y} \quad (2)$$

where:

PET_y are the CO_2 emissions during the year *y* due to transport of the biomass to the project plant in tons of CO_2,
$PEFF_{CO2,y}$ are the CO_2 emissions during the year *y* due to fossil fuels co-fired by the generation facility in tons of CO_2,
GWP_{CH4} is the Global Warming Potential for methane valid for the relevant commitment period,
$PE_{Biomass,CH4,y}$ are the CH_4 emissions from the combustion of biomass during the year *y*.

a. Carbon dioxide emissions from combustion of fossil fuels for transportation of biomass to the project plant (*PET_y*)

GIDL uses in-house generated bagasse as fuel during season and other biomass residues bought out from market during off-season days. Transportation emissions are due to the transportation of the extra biomass residues to the plant site.

Option 1:

Emissions are calculated on the basis of distance and the number of trips (or the average truck load):

$$PET_y = N_y \cdot AVD_y \cdot EF_{km,CO2} \quad \textbf{(3)}$$

or

$$PET_y = \frac{\sum_i BF_{i,y}}{TL_y} \cdot AVD_y \cdot EF_{km,CO2} \quad \textbf{(4)}$$

where:

N_y	is the number of truck trips during the period y.
AVD_y	is the average return trip distance between the biomass fuel supply sites and the site of the project plant in kilometers (km),
$EF_{km,CO2}$	is the average CO_2 emission factor for the trucks measured in t CO_2/km, and
$BF_{i,y}$	is the quantity of biomass type *i* used as fuel in the project plant during the year *y* in a volume or mass unit,
TL_y	is the average truck load of the trucks used measured in tons or volume of biomass,

Option 2:

Emissions are calculated based on the actual quantity of fossil fuels consumed for transportation.

$$PET_y = \sum_i F_{Trans,i,y} \cdot COEF_{CO2,i} \quad \textbf{(5)}$$

where:

$F_{Trans,i,y}$	is the fuel consumption of fuel type *i* during the year *y*,
$COEF_{CO2,i}$	is the CO_2 emission factor of the fuel type *i*,

b. Carbon dioxide emissions from on-site consumption of fossil fuels (*$PEFF_y$*)

The proper and efficient operation of the biomass power plant may require using some fossil fuels, e.g. for start-ups or during winter operation (when biomass humidity is too high). GIDL also co-fire fossil fuels to a limited extent.

CO_2 emissions from combustion of respective fuels are calculated as follows:

$$PEFF_y = \sum_i FF_{project\ plant,i,y} \cdot COEF_{CO2,i} \quad (6)$$

where:

$FF_{project\ plant,i,y}$ is the quantity of fossil fuel type i combusted in the biomass power plant during the year y, and
$COEF_{CO2,i}$ is the CO_2 emission factor of the fuel type i.

c. Methane emissions from combustion of biomass ($PE_{Biomass,CH4,y}$)

$$PE_{Biomass,CH4,y} = EF_{CH4} \cdot \sum_i BF_{i,y} \cdot NCV_i \quad (7)$$

where:

$BF_{i,y}$ is the quantity of biomass type i used as fuel in the project plant during the year y in a volume or mass unit,
NCV_i is the net calorific value of the biomass type i in terajoules (TJ)MWh per mass or volume of biomass,
EF_{CH4} CH_4 emission factor for the combustion of biomass in the project plant tons CH_4 per TJMWh.

This is not included in the project emissions as the CH4 emissions from uncontrolled burning or decay of biomass in the baseline are not being considered.

2. Emission reductions due to displacement of electricity

Emission reductions due to the displacement of electricity calculated by multiplying the net quantity of increased electricity generated with biomass as a result of the project activity (EG_y) with the CO_2 baseline emission factor for the electricity displaced due to the project ($EF_{electricity,y}$), as follows:

$$ER_{electricity,y} = EG_y \cdot EF_{electricity,y} \quad (8)$$

where:

$ER_{electricity,y}$ are the emission reductions due to displacement of electricity during the year y in tons of CO_2,
EG_y is the net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y in MWh,
$EF_{electricity,y}$ is the CO_2 emission factor for the electricity displaced due to the project activity during the year y in tons CO_2/MWh.

Step 1. Determination of $EF_{electricity,y}$

The project activity displaces electricity from other grid-connected sources, Southern grid power generation sources in the project activity. Apart from co-firing fossil fuels in the project plant electricity is not generated with fossil fuels at the project site. The emission factor for the displacement of electricity should correspond to the grid emission factor ($EF_{electricity,y} = EF_{grid,y}$) and $EF_{grid,y}$ is determined as follows:

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

The power generation capacity in the project activity is 16 MW and so the southern grid emission factor has been estimated as per the guidelines in ACM0002, version 05, dated 03 March 2006. (Detail of estimation of Southern Grid Emission Factor is enclosed in Annex 3)

Step 2: Determination of EG_y

EG_y corresponds to the lower value between

(a) The net quantity of electricity generated in the new power unit that is installed as part of the project activity and;

(b) The difference between the total net electricity generation from firing the same type of biomass at the project site and the historical generation of the existing power unit, based on the three most recent years, as follows:

$$EG_y = MIN\left\{\begin{array}{c} EG_{project\ plant,y} \\ EG_{total,y} - \dfrac{EG_{historic,3yr}}{3} \end{array}\right\}$$

where:

EG_y	is the net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y in MWh,
$EG_{project\ plant,y}$	is the net quantity of electricity generated in the project plant during the year y in MWh,
$EG_{total,y}$	is the net quantity of electricity generated in all power units at the project site, generated from firing the same type(s) of biomass as in the project plant[11], including the new power unit installed as part of the project activity and any previously existing units, during the year y in MWh,
$EG_{historic,3yr}$	is the net quantity of electricity generated during the most recent three years in all power plants at the project site, generated from firing the same type(s) of biomass as used in the project plant[11], in MWh.

3. Emission reductions or increases due to displacement of heat

The project activity uses the same boilers in the project activity as it was doing prior to the implementation of it.

$ER_{heat,y} = 0$,

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

As per the methodology ACM0006

$BE_{Biomass,y} = 0.$

D.2.3. Treatment of leakage in the monitoring plan

D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

There are no leakages due to the project activity as per the methodology for the Scenario 12 applied to it.

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

The project activity mainly reduces CO_2 emissions through substitution of power and heat generation with fossil fuels by energy generation with biomass. The emission reduction ER_y by the project activity during a given year y is the difference between the emission reductions through substitution of electricity generation with fossil fuels ($ER_{electricity,y}$), the emission reductions through substitution of heat generation with fossil fuels ($ER_{heat,y}$), project emissions (PE_y), emissions due to leakage (L_y) and, where this emission source is included in the project boundary and relevant, baseline emissions due to the natural decay or burning of anthropogenic sources of biomass ($BE_{biomass,y}$), as follows:

$$ER_y = ER_{heat,y} + ER_{electricity,y} + BE_{biomass,y} - PE_y - L_y \quad (1)$$

where:

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

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored

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.
1	*Low*	*Any direct measurements with mass meters at the plant site would be cross checked with annual energy balance that is based on purchased quantity and stock changes*
5,7	*Low*	*Check consistency of measurements and local / national data with default values by IPCC .If the values differ significantly from IPCC default value, possibly collect additional information or conduct measurements*
2	*Low*	*Check consistency of distance records provided by the truckers by comparing recorded distances with other information or conduct measurements*
3	*Low*	*Check consistency of the number of trips with the quantity of biomass combusted*
4	*Low*	*QA/ QC procedure not required*
6	*Low*	*Consistency of metered fuel consumption quantities should be checked with purchase receipts*
8,9	*Low*	*Consistency of metered net electricity generation should be cross checked with receipts from sales and the quantity of biomass fired*

D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

There are no leakages due to the project activity as per the methodology for the Scenario 12.

D.5 Name of person/entity determining the monitoring methodology:

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

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

Year	Project Emissions
	tCO2/yr
2006-07	41
2007-08	41
2008-09	41
2009-10	41
2010-11	41
2011-12	41
2012-13	41

E.2. Estimated leakage:

As per the methodology no leakage considered in the project activity.

E.3. The sum of E.1 and E.2 representing the project activity emissions:

Year	Emissions due to project activity
	tCO2/yr
2006-07	41
2007-08	41
2008-09	41
2009-10	41
2010-11	41
2011-12	41
2012-13	41

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

Baseline emissions due to natural decay or uncontrolled burning of anthropogenic sources of biomass
These emissions are not being considered in the project activity. It is more conservative.

$BE_{Biomass,y} = 0.$

E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:

Year	Emissions reduction due to electricity displacement	Project Emissions	Leakage	Emissions Reduction
	tCO2/yr	tCO2/yr	tCO2/ yr	tCO2/yr
2006-07	40224	41	0	**40182**
2007-08	40224	41	0	**40182**
2008-09	40224	41	0	**40182**
2009-10	40224	41	0	**40182**
2010-11	40224	41	0	**40182**
2011-12	40224	41	0	**40182**
2012-13	40224	41	0	**40182**

E.6. Table providing values obtained when applying formulae above:

Year	Emissions reduction due to electricity displacement	Emissions due to project activity	Emissions Reduction
	tCO2/yr	tCO2/yr	tCO2/yr
2006-07	40224	41	**40182**
2007-08	40224	41	**40182**
2009-10	40224	41	**40182**
2010-11	40224	41	**40182**
2011-12	40224	41	**40182**
2012-13	40224	41	**40182**
2013-14	40224	41	**40182**

SECTION F. Environmental impacts

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

EIA study is not required for the project activity as per the guidelines of APPCB in Andhra Pradesh for the project. The cogeneration plant is using the pre-project boilers and for that GIDL had taken approvals from authorities. GIDL also received approvals from concerned authorities for expanding the capacity of cogeneration plant as needed.

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The impacts from the project activity were considered to be positive. The project activity entails adopting the environment friendly measures to prevent damage to the environment.

SECTION G. Stakeholders' comments

G.1. Brief description 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 process was carried out for taking the views of Sarpanch of gram panchayat, the representative of the village. Also, GIDL invited views of one and all through newspaper advertisement.
The project proponent has covered stakeholder consultation at different levels. Following are the stakeholder to the project activity:

1. APPCB
2. Gram panchayat
3. MoEF
4. Local People

G.2. Summary of the comments received:

GIDL invited views of people at all levels i.e. through local meetings, newspaper advertisements, gram panchayat. People responded to the call and presented their views and raised queries about the project, which GIDL responded to appropriately. Project activity was found to be having only positive impact.

A meeting was conducted with local people at the plant premises. Mr. G Madhava Raju, Vice President presided over the meeting. He welcomed all and gave a brief on CDM and Kyoto Protocol. He told the audience about the 16 MW cogeneration project. He explained how these projects are making significant positive impacts on the environment. All participants enthusiastically participated in the discussions on the projects and raised various queries which were appropriately answered to.

Q1: Does this lead to an increment in pollutants (air, water, noise)

Ans: No. The project is based on biomass based fuel and only some coal is being burnt in the boiler. The biomass is GHG neutral and thus it helps in reduced emissions from power generation plant. GIDL is planning to further reduce coal consumption from coming season and shall only use biomass residues in the cogeneration plant.

Q2: Does the project create employment opportunities in the area?

Ans: Yes. The project has created distinct employment opportunities during construction and now in the operation of the plant. GIDL purchases biomass residues from farmers and that gives them another source of revenue. People have been employed with contractors and transporters for management of the bagasse and other biomasses.

Q3: If the project is cleared by APPCB

Ans: Yes. The project is in-line with rules and regulations of the APPCB We have got approvals/ consents from APPCB on air and water.

Q4: How the project helps in environment conservation

Ans: The burning of coal results in carbon di oxide emissions so any reduction of its combustion would lead to reduction in CO2 emissions. Also, Ash content is low in bagasse and other biomass so the problems of ash handling and disposal are also minimized.

Conclusion:
Participants appreciated the efforts made by GIDL and offered their cooperation to take it further in their future projects. Mr. G Madhava Raju thanked all for their cooperation and meaningful discussion on the project.

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

No adverse comment on the project activity was received from any of the stakeholder parties.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	GMR Industries Ltd. (sugar Division)
Street/P.O.Box:	Sankili
Building:	Amadalavalasa Mandal
City:	Regidi, Srikakulam District
State/Region:	Andhra Pradesh
Postfix/ZIP:	532 440
Country:	India
Telephone:	+91-8941-237546/535/37/514
FAX:	+91-8941-237516
E-Mail:	
URL:	www.gmrgroup.co.in
Represented by:	
Title:	Mr.
Salutation:	
Last Name:	Rao
Middle Name:	M.
First Name:	Prabhakar
Department:	New projects & CDM
Mobile:	+91 99499 90064
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Direct tel:	+91-40-23410191-195
Personal E-Mail:	Prabhakarrao.madhuranthakam@gmrgroup.co.in, prmadhura@yahoo.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No ODA funding involved in 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 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 project activity supplies power to SR Grid; 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

MONITORING PLAN

Project Monitoring Plan

GIDL is an ISO-9001 certified company, 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 department heads. 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 cogeneration unit of the sugar complex. Mr. V. Ramgopal Patnaik, General Manager- Cogeneration Power Plant is the head of operations and responsible for the overall functioning of the Cogeneration plant at the complex. Mr. D.V.S. Choudhary, Manager – Power assist him in running the plant on a daily basis.

Mr. M Prabhakar Rao (Incharge - CDM) is overall responsible for registration, monitoring, measurement and reporting.

A CDM project team will be constituted with participation from Operation, Maintenance, Purchase & Stores, Quality, Sales & Marketing, R&D and finance. This team will first be trained on 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 project team.

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

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 monthly 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 members, it is informed to the concerned person for necessary actions. Further these reports are forwarded to the management monthly basis,.

- ***Unit Head:*** Overall responsibility of compliance with the CDM monitoring plan.
- ***Co-generation unit In-charge:*** 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 principles, 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-
The reliability of the meters is checked by testing the meters on yearly basis. 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 is an ISO-9001 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. Corrective action shall be taken by the concerned department 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 5

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