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:

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NSSM – Narkatiaganj Biomass Power Project
Version 2,
05/11/2006

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

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The proposed project activity is the expansion of the power generation capacity in the sugar unit of New Swadeshi Sugar Mill (NSSM) located at Narkatiaganj, Bihar. The project involves the installation of a new 10 MW backpressure turbine and enhancing the capacity of Boiler 1 from 80 TPH to 96 TPH (See table below). The new turbine will operate in conjunction with the present steam and power generation configuration. The implementation of the project activity will permit the plant to supply electricity to the Bihar State Electricity Board (BSEB). The 10 MW backpressure turbine will be powered by steam generated from the combustion of bagasse, a by-product of the sugar manufacturing process. The export of electricity to the regional grid will thus lead to a reduction in GHG emission through the substitution of the predominantly fossil fuel dominated electricity generation in the northern region grid.

The unit is currently energy independent, employing co-generation for its captive steam and power requirement. The present captive steam and power requirement of the sugar unit is met by a cogeneration plant comprising of seven boilers and three turbines. The detail of these equipments is provided in the table below:

Boilers	Turbines
Boiler 1 – 80 TPH, 45 kg/cm^2	TG 1 – 3 MW backpressure
Boiler 2 – 32 TPH, 32 kg/cm^2	TG 2 – 3 MW backpressure
Boiler 3 – 32 TPH, 32 kg/cm^2	TG 3 – 660KW backpressure
Boiler 4 – 7 TPH, 11 kg/cm^2	
Boiler 5 – 4 TPH, 11 kg/cm^2	
Boiler 4 – 4 TPH, 11 kg/cm^2	
Boiler 4 – 4 TPH, 11 kg/cm^2	

The newly installed turbine will be operating with one of the 3 MW turbines. The other 3 MW turbine will not be used and discarded. Bagasse[1] will be used to generate steam in the boiler, which in turn will power the turbines to generate electricity. The surplus electricity generated from this system will be exported to the regional grid. The export of this renewable source of electricity to regional grid will displace the same amount of electricity generated by fossil fuel dominated power plants in the regional grid. Thus the project activity will assist in reduction of the green house gases (GHG).

Project contribution to sustainable development:
The project is complying with the sustainable development policy of the Ministry of Environment and Forests through following scenarios:

[1] Bagasse is a by-product of sugar manufacturing process.

The project makes a significant contribution to development as any rurally based industry in India provides an important source of direct and indirect employment. At present the factory provides direct employment to 700 persons. During the cane crushing season many people get indirect employment opportunities. NSSM has a full fledged wing for cane development consisting of 30 qualified agricultural graduates to provide technical know how to the cane growers.

The provision of electricity supply to grid should generate extra revenue for the factory. This would help the company to improve its financial position, which in turn will lead to modernisation, diversification and expansion. Since sugar industries are located in rural areas and cater the needs of local farmers, the fresh investment by the company will directly benefit the farmers and local community. The benefits will be in terms of enhanced employment, both direct and indirect, as well as improving opportunities for the farmers.

The project activity has direct environmental benefits through GHG reductions through the displacement of the fossil fuel dominated electricity generation in the regional grid by an emission neutral renewable source. In addition to the reduction in carbon dioxide (CO_2) emissions the implementation of the project activity will lead to a reduction in other harmful gases (NOx and SOx) that arise from the combustion of coal in power generation. The project will also lead to reduced ash generation since the ash content2[2] in bagasse is lower than that of Indian coal.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity (ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host)	**Private entity:** The Oudh Sugar Mills Ltd.	No
India (host)	**Private entity**: DSCL Energy Services Company Ltd.	No
United kingdom	**Private entity:** Agrinergy Ltd.	No

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

The Oudh Sugar Mills Ltd. is the project owner, and DSCL Energy Services Company Ltd. and Agrinergy Ltd. are CDM project developers. The official contact for the CDM project activity is The Oudh Sugar Mills Ltd., New Delhi, contact details as listed in Annex I.

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

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The proposed project activity is a grid-connected bagasse based cogeneration plant. The project activity involves the capacity enhancement of a 45 kg/cm^2 boiler and the installation of a 10 MW backpressure turbine.

[2] Indian Coal – 30% to 40% & Bagasse – 2%

The 10 MW backpressure turbine is supplied by M/s Chola Turbo Machinery International. Power will be generated at 11 kV and stepped-up on-site to 132 kV before being transmitted to the nearby BSEB sub-station.

The technology employed in the project activity is readily available in India. The individual suppliers of the equipments will train the staff in charge at the NSSM after commissioning to operate and maintain the equipment. The suppliers will also provide a comprehensive set of manuals providing details for the maintenance schedule and the required activities associated with maintenance.

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

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A.4.1.1. Host Party(ies):

>>
India

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

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West Champaran, State Bihar

A.4.1.3. City/Town/Community etc:

>>
Narkatiaganj

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

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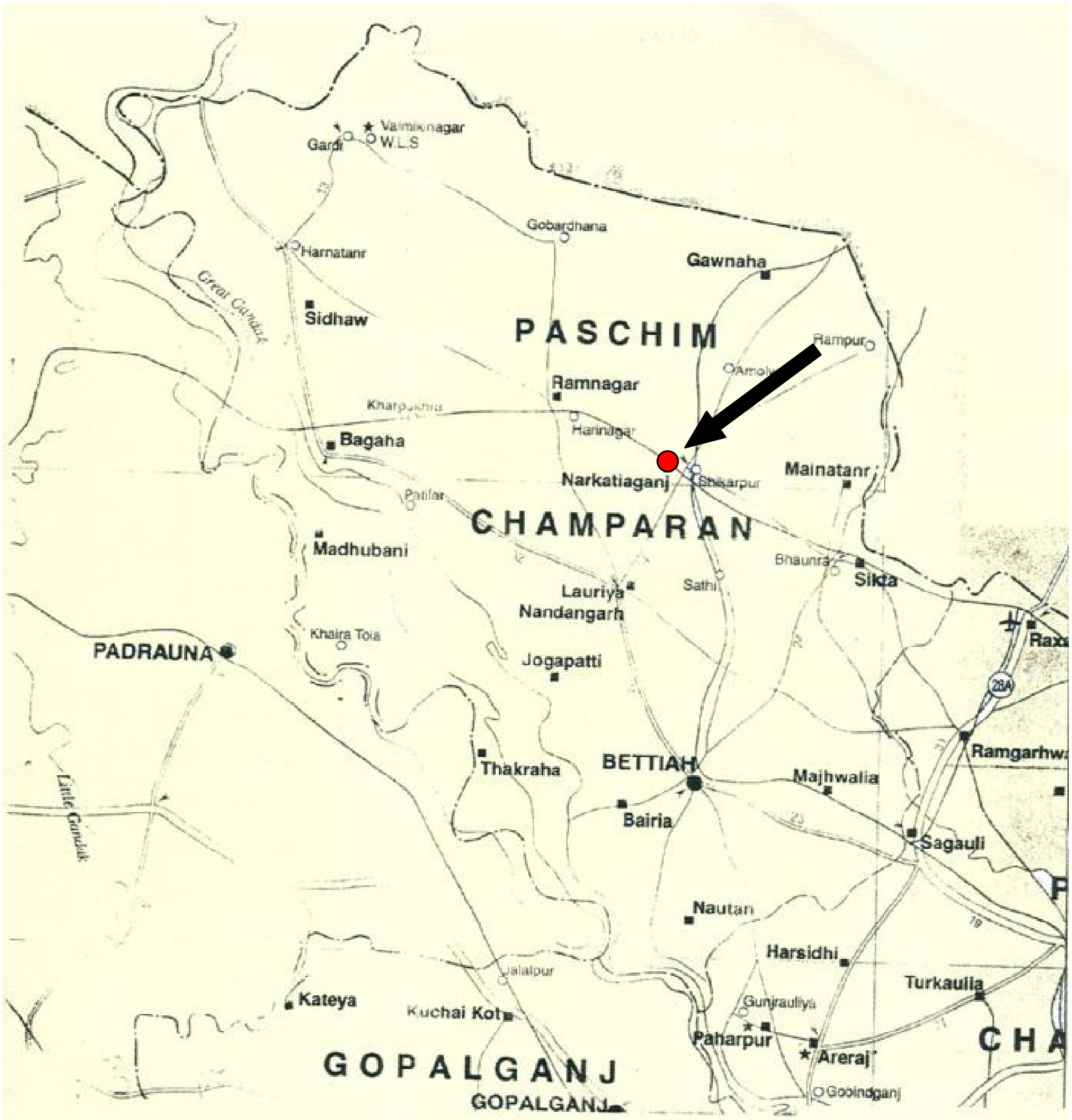
The exact postal address is as:

New Swadeshi Sugar Mills
A Unit of The Oudh Sugar Mills Limited
P.O. Narkatiaganj, West Champaran,
Bihar - 845455, INDIA

The factory lies north of Bettiah and lies close to the foot hills of Himalaya range. Narkatiaganj is situated at a latitude and longitude of 27.38N and 80.45E respectively. The following map shows the exact location of the project activity.



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

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Type I – Renewable Energy Projects

D – Grid connected renewable electricity generation

As mentioned in section A.2. the project activity generates renewable energy by the combustion of bagasse, a renewable biomass. The surplus electricity export will displace electricity generated within the predominantly fossil fuel regional grid.

The project activity will remain eligible as a small scale project throughout its life time due to its inability to scale-up the capacity, without the purchase of additional turbines and boilers.

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:

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The electricity generation from the proposed project activity will displace existing and planned electricity generated from the grid. The electricity generation from the project activity takes place through the combustion of bagasse, a biomass which qualifies as a renewable form of energy. Thus, the proposed project activity will reduce anthropogenic emissions.

The project is expected to result in annual certified emission reductions of 11,975 tCO_2e per annum.

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

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A ten year crediting period has been chosen.

Year	Annual estimation of emission reduction in tonnes of CO_2e from power export
2006	11,975
2007	11,975
2008	11,975
2009	11,975
2010	11,975
2011	11,975
2012	11,975
2013	11,975
2014	11,975
2015	11,975
Total estimated reductions (tonnes CO_2e)	119,750
Total number of crediting years	10 years
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	11,975

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

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There is no public funding of the project activity.

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

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As per Appendix C, paragraph 2 of the Simplified Modalities and Procedures for Small-Scale CDM project activities states:

"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."

As there is currently no registered CDM project at the site either large scale or small scale, the project will meet the criteria on debundling.

SECTION B. Application of a baseline methodology:

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

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Type I – Renewable Energy Projects

AMSID – Grid connected renewable electricity generation version 9, 28 July 2006

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

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The project activity meets the eligibility conditions as follows

1. It generates renewable electricity from the combustion of bagasse, a renewable biomass that will displace electricity from the grid
2. The project activity involves the addition of a new 10 MW back pressure turbine. This 10 MW turbine will run along with one of the 3 MW turbine. The other 3 MW turbine will not be used and discarded, hence the combine power generation capacity will be 13 MW (less than 15 MW small scale limit).

The project activity will remain eligible as a small scale project throughout its life time due to its inability to scale-up the capacity, without the purchase of additional turbines and boilers.

With reference to the Appendix B of the Simplified Baseline and Monitoring Methodologies, "the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO2equ/kWh) calculated in a transparent and conservative manner as:

(i) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002.

Table : Data used to determine the baseline scenario

Baseline data	Key information	Source
Grid generation	Generation data of grid based generating units	Central Electricity Authority
Grid emissions	Fossil fuel consumption of grid based generating units	Central Electricity Authority
Capacity expansions	Timing of expansions to determine build margin	State electricity boards and generating companies
Net calorific value of fossil fuel used in grid plants		IPCC
Emissions factor of fossil fuel used in grid plants		IPCC
Oxidation factor of fossil fuel used in grid plants		IPCC

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:

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In line with attachment A to appendix B of the simplified M&P for small-scale CDM project activities, demonstration of additionality focuses on the barriers facing the project. In showing that the project is additional we demonstrate that it is not part of the baseline scenario, which in the case of the NSSM would be the continuation of the present practice of power generation for captive consumption with no export to grid.

Cane Availability:

There is significant fluctuation in the availability of sugarcane around the plant region. The sugar cane yield has shown wide variations during the past years (see table below for details). The scarcity of irrigation facilities is the main reason behind this fluctuation. Almost 70% of the area surrounding the plant is without irrigation and due to this sugarcane crop is raised under rain condition. Therefore the uncertainty in weather conditions will also play an important role in determining the cane availability and hence the generation of biomass and the operation of the plant.

	2001-02	2002-03	2003-04	2004-05	2005-06	Mean
Area Under Cane (H)	21300	25100	16800	20272	27120	22118
Sugar Cane Production(T)	747790	1020175	623700	545500	921600	771753
Sugar Cane Yield (T/H)	35.11	40.64	37.13	26.91	33.98	34.75

There has also been significant price fluctuation[3] in agriculture markets over the recent years in the state and due to this the continuous availability of cane for the sugar industry is a risk that the project will face. Any shortfall in the availability of cane will have an immediate impact on the export of electricity and hence the returns of the project.

Common Practice:

The second major barrier associated with the project activity is that the electricity generation and export to the regional grid is not a common practice in the state. The proposed project activity is the first co-generation based grid connected power project in the region. This poses a risk in terms of unforeseen circumstances that could make the project unviable.

PPA:

The most severe barrier is the uncertainty associated with the Power Purchase Agreement (PPA). NSSM has agreed on the terms and conditions of the PPA with BSEB. The electricity purchase price is yet to be finalised. The Bihar Electricity Regulatory Commission has just been constituted and the rules and regulations for Power Purchase are yet to be framed. NSSM has requested the Bihar State Government to adopt the tariff structure of PPA at par with Paschimanchal Vidyut Vitran Nigam Limited[4] (PVVNL) for present and review it at a later date. The uncertainty associated with the power purchase price poses a risk on viability of the proposed project activity.

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

[4] PVVNL is an operating public utility in the state of Uttar Pradesh and has license to supply power in parts of state and whereas the PVVNL in its board of directors meeting held on 24/08/05 has authorised Uttar Pradesh Power Corporation Limited (UPPCL) to execute/sign the power purchase agreement and also authorised UPPCL to do the necessary relevant works on behalf of PVVNL.

The prospect of CER revenue has therefore helped the NSSM management overcome the risks and barriers faced by the project activity.

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:

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As per the rules and procedures for small scale type ID projects "*The project boundary encompasses the physical, geographical site of the renewable generation source*". The boundary therefore encompasses the turbine generator and the boiler.

In terms of gases, the project boundary is restricted to CO_2. The boundary for the calculation of the grid emission coefficient is the northern regional grid in India. The Indian power grid system is split into five regions. The regional grids facilitate the transfer of electricity between states, which is supplied by state-owned and central sector power generating stations. The Bihar state falls within the Northern Region, hence the Northern Grid is chosen for analysis.

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

>>
The emissions baseline (BE_y) is the product of the energy baseline (EG_y) and the CO_2 emissions coefficient (EF_y) for the fuel displaced. As discussed earlier we have adopted the approach specified in the Simplified Baseline and Monitoring Methodologies for Type ID projects to calculate the CO_2 emissions coefficient of the electricity grid. Specifically, we have chosen approach 9 (a), the kWh of electricity exported by the renewable generating unit multiplied by the combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002. This is appropriate as in the case of the project activity the baseline scenario is that the factory continues to purchase power from the grid.

In line with the methodology to calculate the carbon dioxide emissions factor, we use the relevant sections of ACM0002 (Consolidated baseline methodology for grid-connected electricity generation from renewable sources). The combined margin presented below consists of the calculation of the average of the Operating Margin (OM) and the Build Margin (BM). In calculating the OM, we select the Simple OM option. Whilst Dispatch Data Analysis is the preferred method of calculating the OM, this is not selected because the required dispatch order data are not available in India.

The first step in selecting the Simple OM is to show that the proportion of low-cost/must run resources are less than 50% of total generation in the average of the last 5 years of data[5]. Low cost/must-run resources typically include hydro, geothermal, wind/ low cost biomass nuclear and solar generation. In addition, we must consider the possibility that coal is obviously used as must-run. In the Northern Region, the marginal costs of generation from coal are above those of renewable sources such as hydro, wind, nuclear and low-cost biomass. Moreover, coal plants have the possibility to "ramp-up" and "ramp-down". We therefore conclude that coal generation is not an obvious must-run resource. Low-cost/must run resources identified are therefore restricted to hydro and nuclear (the CEA does not provide any generation data from low-cost biomass and wind resources in the Northern Region). The following table clearly demonstrates the low percentage that low-cost/must run sources constitute of total generation and therefore confirms the choice of Simple OM.

[5] We have used a 4 year average as data for 5 years generation is not available, see http://www.cea.nic.in/god/opm/Monthly_Generation_Report/index_Monthly_Generation_Report.html

Table 3: Units operating in the Northern Region

	2005-6 Generation, GWh	2004-5 Generation, GWh	2003-4 Generation, GWh	2002-3 Generation, GWh
Thermal	131,504	131,482	123,737	118,337
Nuclear	41,713	36,105	37,288	30,221
Hydro	6,444	7,338	7,364	8,642
Hydro/nuclear as % of total	26.80%	24.84%	26.52%	24.72%

Source: CEA Generation report, http://www.cea.nic.in/newweb/opt2_mon_gena.htm

The calculation of the Simple OM initially requires us to calculate a CO_2 emission coefficient for thermal power plants based on the type of fuel used.

As per the methodology, the CO_2 emission coefficient $COEF_i$ is obtained from the following equation:

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

Where:

NCV_i is the net calorific value (energy content) per mass unit of a fuel *i*,
$OXID_i$ is the oxidation factor of the fuel,
$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i*.

In line with the methodology where available, local values of NCV_i and $EF_{CO2,i}$ should be used. If no such values are available, country-specific values should be used. The following table shows the NCV and EF factors used in the calculation of the Northern Region emission factor.

Table 4: Factors used in calculation of the CO_2 emission coefficient

	NCV_i,		$OXID_i$, %		$EF_{CO2,i}$, tC/TJ	
	Factor	Source	Factor	Source	Factor	Source
Coal	19.98 TJ/kt	IPCC	98	IPCC	25.8	IPCC
Gas	37.68 TJ/cbm	Gail and IPCC[6]	99.5	IPCC	15.3	IPCC
HSD	43.33	IPCC	99	IPCC	20.2	IPCC
Naptha	45.01	IPCC	99	IPCC	20	IPCC

ACM0002 states "Plant emission factors used for the calculation of operating and build margin emission factors should be obtained in the following priority:

1. Acquired directly from the dispatch center or power producers, if available; or
2. Calculated, if data on fuel type, fuel emission factor, fuel input and power output can be obtained for each plant; if confidential data available from the relevant host Party authority are used the calculation carried out by the project participants shall be verified by the DOE and the CDM-PDD may only show the resultant carbon emission factor and the corresponding list of plants.

[6] http://www.gailonline.com/customerzone/power.htm. NCV 90% of GCV.

3. Calculated, as above, but using estimates such as: default IPCC values from the IPCC 1996 Revised Guidelines and the IPCC Good Practice Guidance for net calorific values and carbon emission factors for fuels instead of plant-specific values (note that the IPCC Good Practice Guidance includes some updates from the IPCC 1996 Revised Guidelines); technology provider's name plate power plant efficiency or the anticipated energy efficiency documented in official sources (instead of calculating it from fuel consumption and power output). This is likely to be a conservative estimate, because under actual operating conditions plants usually have lower efficiencies and higher emissions than name plate performance would imply; conservative estimates of power plant efficiencies, based on expert judgments on the basis of the plant's technology, size and commissioning date; or
4. Calculated, for the simple OM and the average OM, using aggregated generation and fuel consumption data, in cases where more disaggregated data is not available."

In India, the CEA is not a dispatch centre, and therefore Option 1 above cannot be calculated. Option 2 can be taken in so far as the CEA does provide coal consumption data for each plant. However the CEA does not provide coal NCV figures for each plant and therefore IPCC data has been used.

In the case of gas stations, individual fuel consumption for each plant is not available. Aggregate consumption at the state and regional level is instead provided by the CEA. These data are only available for 2004-5 therefore we use these data to derive an average emission factor for gas stations in the Northern Region. The average emission factor is then applied to 2004-05 generation in the calculation of the CM[7].

The data on fuel consumption and generation for gas stations in the Northern Region is outlined below:

Table 5: Fuel Consumption and generation from gas stations in the Northern Region 2004-05

State	Natural gas consumption (mcbm)	HSD consumption (kl)	Naptha consumption (kl)	Total Generation (GWh)
Delhi	968	11	0	4,091
Jammu & Kashmir	0	5,209	0	24
Rajasthan	220	4,083	0	354
Central	2,870	265,744	243,961	15,522
Total				19,991

Source: CEA General Review 2006, Table 6.1, pp. 117

These data are combined with the above data on fuel specific gravities, calorific values, emission factors and oxidation factors to determine total emission from the above gas stations:

Table 6: Total emissions from gas stations in Northern Region, 2004-05

State	Emission from natural gas (tCO_2)	Emissions from HSD (tCO_2)	Emissions from Naptha (tCO_2)	Total Emissions (tCO_2)
Delhi	2,161,331	31	0	2,161,362
Jammu & Kashmir	0	14,564	0	14,564

[7] Steam stations use coal but gas may be also used as auxiliary fuel at these stations. The volume used is small and exclusion of this gas from fuel consumption calculation is conservative.

Rajasthan	491,212	11,416	0	502,627
Central	6,408,079	743,007	621,814	7,772,900
Total	9,060,621	769,018	621,814	10,451,453

Dividing total emissions by total generation from gas stations gives an average emission factor for gas stations in the Northern Region of 0.5228 tCO_2/MWh for 2004-05.

Annual generation data for each power plant in the Northern Region is provided by the CEA[8]. (http://cea.nic.in/god/opm/Monthly_Generation_Report/18col_05_03.pdf).

Coal consumption data for thermal power plants is also provided by the CEA report "Performance Review of Thermal Power Stations". (http://cea.nic.in/Th_per_rev/start.pdf). The CEA year runs from April to March.

Net imports from connected grid systems must also be considered. As outlined in ACM002, net imports from connected systems are only accounted for in the Operating Margin calculation. In terms of the applicable emissions factor, ACM002 states that:
"For the purpose of determining the Operating Margin (OM) emission factor, as described below, use one of the following options to determine the CO2 emission factor(s) for net electricity imports (*COEFi,j,imports*) from a connected electricity system within the same host country(ies):

(a) 0 tCO2/MWh, or
(b) the emission factor(s) of the specific power plant(s) from which electricity is imported, if and only if the specific plants are clearly known, or
(c) the average emission rate of the exporting grid, if and only if net imports do not exceed 20% of total generation in the project electricity system, or
(d) the emission factor of the exporting grid, determined as described in steps 1,2 and 3 below, if net imports exceed 20% of the total generation in the project electricity system."

Net imports from other regional grids account for less than 20% of total generation and therefore the average emission rate of the exporting grid may be selected. The determination of the carbon emissions factors for the exporting grids is based on an average grid emission rate as outlined in the methodology. The following tables outline the net import data and the emission factors for each grid:

Table 9: Net Imports from Other Regional Grids to the Northern Region (GWh)

	2004/05	2003/04	2002/03
From Southern	110.3	0	0
From Western	1365.2	0	0
From Eastern	3943.4	2077.5	1635.9
From N Eastern	182.8	38.5	0

Table 10: Average emission rates for other Regional Grids (tCO2/MWh)

	2004/05	2003/04	2002/03
Northern CEF	0.8429	0.8138	0.8330
Southern CEF	0.8870	0.8990	0.8590
Western CEF	1.1393	1.1367	1.1390

[8] http://cea.nic.in/god/opm/Monthly_Generation_Report/18col_05_03.pdf and http://cea.nic.in/god/opm/Monthly_Generation_Report/18col_04_03.htm

N Eastern CEF	0.3703	0.4240	0
Eastern CEF	1.2183	1.2300	1.1655

Combining the above emission factors for coal and gas based stations and imports, with generation data (and in the case of coal plants fuel consumption data) from the CEA provides the following[9]:

[9] It should be noted that the CEA also provide data on specific secondary fuel oil consumption in coal plants. For conservativeness we have no included these emissions in calculation of the OM and BM.

Table 11: Calculation of the Simple OM

	Generation, GWh			Coal Consumption (kt)			Emissions (tCO_2)		
Plant	2004-5	2003-4	2002-3	2004-5	2003-4	2002-3	2004-5	2003-4	2002-3
Coal Plants									
Delhi									
Faridabad	5,464	5,432	5,284	3,732	3,605	3,554	6,912,805	6,677,563	6,583,095
I.P.Stn.(DVB)	921	771	619	789	639	497	1,461,469	1,183,623	920,596
Rajghat(DVB)	696	775	837	541	629	705	1,002,097	1,165,100	1,305,876
Haryana									
Faridabad	869	795	973	822	740	880	1,522,595	1,370,706	1,630,029
Panipat	6,008	5,949	4,994	4,447	4,473	3,718	8,237,204	8,285,364	6,886,873
Punjab									
Bhatinda	1,993	2,553	2,497	1,469	1,835	1,763	2,721,037	3,398,981	3,265,615
Lehra Mohabbat	3,308	3,379	2,907	1,995	2,041	1,820	3,695,350	3,780,556	3,371,197
Roper	9,082	8,303	8,246	6,056	5,585	5,418	11,217,564	10,345,128	10,035,793
Rajasthan									
Kota	7,751	6,758	6,551	5,213	4,477		9,656,070	8,292,773	8,038,763
Suratgarh	9,363	8,303	7,289	5,920	4,984		10,965,651	9,231,892	8,104,452
Uttar Pradesh									
Anpara	11,511	11,982	11,693	8,339	8,342	8,074	15,446,378	15,451,935	14,955,517
Harduaganj	632	733	769	670	785	805	1,241,045	1,454,060	1,491,106
Faridabad	5,550	6,247	6,528	4,761	5,372	5,566	8,818,828	9,950,587	10,309,934
Panki Extn.	1,043	1,065	1,016	913	953	995	1,691,155	1,765,247	1,843,044
Paricha	966	655	961	876	590	847	1,622,620	1,092,860	1,568,903
Tanda (NTPC)	3,320	2,912	2,223	2,596	2,331	1,990	4,808,586	4,317,725	3,686,089
Unchahar (NTPC)	6,781	6,454	6,151	4,604	4,396	4,153	8,528,016	8,142,736	7,692,626
Rihand STPS	7,987	7,958	7,752	4,768	4,742	4,787	8,831,794	8,783,634	8,866,988
Singrauli(STPS)	15,806	15,644	16,168	10,336	9,742	10,213	19,145,433	18,045,163	18,917,600
NCTPP(Dadri)	6,830	6,185	6,043	4,432	4,136	4,005	8,209,419	7,661,137	7,418,485
Gas Plants	Generation, GWh						Emissions (tCO2)		
Delhi									
I.P GT	1,162	957	935				607,662	500,329	488,827

I.P. WHP	378	253	280	197,821	132,271	146,387
Pragata CCGT	2,551	2,405	825	1,333,531	1,257,358	431,318
Haryana						
F'bad CCGT	3,162	2,792	2,697	1,653,073	1,459,686	1,410,019
Jammu & Kashmir						
Pampore GT	24	29	58	12,412	15,161	30,323
Rajasthan						
Ramgarh GT	343	241	161	179,287	125,997	84,172
Ramgarh ST	17	0	0	8,888	0	0
Anta GT (NTPC)	2,785	2,777	2,760	1,456,026	1,451,843	1,442,956
Uttar Pradesh						
Auraiya GT	4,120	4,252	4,272	2,153,820	2,222,988	2,233,444
Dadri GT	5,458	5,062	5,212	2,853,445	2,646,464	2,724,886
Imports	Generation, GWh			Emissions (tCO2)		
From Southern	110	0	0	97,836	0	0
From Eastern	3,943	2,078	1,636	4,804,203	2,559,360	1,906,714
From Western	1,365	0	0	1,555,430	0	0
From North Eastern	183	39	0	67,683	16,325	0
Totals	131,482	123,737	118,337	152,716,237	142,784,557	137,791,627
Simple OM				1.1615	1.1539	1.1644
Average Simple OM						1.1599

The final Simple OM, $EF_{OM, y}$, based on the average of the last three years for which data is available is therefore 1.1599 tCO_2/MWh.

In considering the BM we are required to calculate the carbon emissions factor based on an examination of recent capacity additions to the Northern region grid. These capacity additions should be chosen from the greater generation accounted for:

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

The total generation of the grid under consideration is 179662.76 GWh (http://cea.nic.in/god/opm/Monthly_Generation_Report/18col_05_03.pdf), 20% of which is 35932.55 GWh. The five most recent plants only account for 594 GWh and therefore the sample to determine the build margin is selected on the basis of the "power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently". The full set of generating plants in the Northern Region is provided by the CEA generation report (http://cea.nic.in/god/opm/Monthly_Generation_Report/18col_05_03.pdf).

Commissioning dates for all generation units included in the CEA generation report have been obtained. The following table shows in chronological order the commissioning dates for the most recent 20% of commissioned plants and the total generation they supply. For the plants commissioned during 2005 and early 2006 some of the data is not available on the commissioning date, however given that the determination of the sample size includes all these plants their exact order of commissioning is immaterial to the calculation.

The calculation of the BM requires us to undertake a generation weighted average of the emissions factors of the individual plants, this is shown in the following table. We have chosen to calculate the BM using Option 1 therefore the BM emission factor will be held constant over the crediting period chosen.

Table 12: Identification of plants in BM

Plant	Capacity addition, MW	Date of addition	Generation, GWh	Emissions, tCO2
Leh. Moh.	210	Oct-98	1,654	2,313,085
Tanda	110	Dec-98	830	1,202,146
Unchahar	210	Jan-99	1,695	2,132,004
Suratgrah	250	Feb-99	1,873	2,193,130
F'bad CCGT	143	Sep-99	1,054	551,024
Unchahar	210	Oct-99	1,695	2,132,004
F'bad CCGT	143	Oct-99	1,054	551,024
RAPS I-IV	220	Jun-00	1,361	0
Ranjit Sagar	600	Jul-00	1,145	0
Ghanvi	11.25	Jul-00	37	0
F'bad CCGT	143	Jul-00	1,054	551,024
Suratgrah	250	Oct-00	1,873	2,193,130
Ghanvi	11.25	Dec-00	37	0
RAPS I-IV	220	Dec-00	1,361	0
Panipat	210	Mar-01	1,467	2,011,410
Malana	86	Jun-01	270	0

Upper Sindh	70	Dec-01	98	0
Suratgrah	250	Jan-02	1,873	2,193,130
Pragati	104.6	Mar-02	808	422,177
Suratgrah	250	Jul-02	1,873	2,193,130
Upper Sindh	35	Sep-02	49	0
Pragati	104.6	Nov-02	808	422,177
Pragati	121.18	Jan-03	936	489,096
Baspa	300	Jun-03	1,193	0
Chamera II	300	Jul-03	1,347	0
Suratgrah	250	Aug-03	1,873	2,193,130
Ramgarh GT	37.5	Sep-03	171	89,644
Ramgarh ST	37.8	Sep-03	17	8,888
Nathpa Jhakri	250	Oct-03	852	0
Chenani III	9.8	Jan-04	23	0
Gumma	3	Jan-04	4	0
Nathpa Jhakri	250	Jan-04	852	0
Nathpa Jhakri	250	Mar-04	852	0
Nathpa Jhakri	250	Mar-04	852	0
Nathpa Jhakri	250	May-04	852	0
Nathpa Jhakri	250	May-04	852	0
Kota	195	Aug-04	1,446	1,801,850
WY Canel	14.4	Jan-05	67	0
Bhakra	75		324	0
Ganguwal	6.1		42	0
Kotla	7.1		41	0
Pong	36		157	0
Badarpar	15		112	91,740
F'bad Extn	15		66	100,551
Baira Siul	18		72	0
Chenani	10		5	0
Obra	68		244	0
H'gang B	25		29	2,280
Ey Canal	6		2	0
Dhauli Gang	280	Nov-05	314	0
Totals			37,561	25,837,776
BM CEF, tCO2/MWh				0.6879

Source: List of all plants and generation from CEA generation report. Commissioning data from CEA, state electricity boards and NTPC websites.

The weights applied to the operating and build margin are fixed at 0.5, therefore in order to calculate the combined margin we apply these to the Simple OM and BM as calculated above. The following table shows this calculation arriving at the combined margin of 0.924 tCO_2/MWh.

Table 13: Calculation of the combined margin

	tCO_2/MWh
Simple OM, $EF_{OM, y}$	1.160
Build margin $EF_{BM, y}$	0.688

Combined margin, EF_y	0.924

Baseline section completed: 05/11/2006
Completed by
Ben Atkinson, contact details as per Annex 1.
Charu Gupta, contact details as per Annex 1.

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:

>>
21/03/2005

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

>>
20 years

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

>>
A fixed ten-year crediting period has been chosen.

C.2.1. Renewable crediting period:

>>
Not applicable.

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

>>
Not applicable.

C.2.1.2. Length of the first crediting period:

>>
Not applicable.

C.2.2. Fixed crediting period:

>>
Chosen crediting period.

C.2.2.1. Starting date:

>>
01/01/2006 or the date of registration whichever is later.

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:

>>

AMS ID, Grid connected renewable electricity generation version 9, 28 July 2006
As per the Simplified Baseline and Monitoring Methodologies the "Monitoring shall consist of metering the electricity exported to grid by the renewable technology".

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

>>

The project activity will produce renewable electricity that will displace the electricity from the grid. Electrical generation and export from the project activity will be metered at the plant and recorded regularly. These meter readings will form the basis of the monitoring plan and be made available at the time of verification.

D.3 Data to be monitored:

>>

The monitoring of data revolves around the net electricity exported to grid (EG_y). The emission factor will be applied to net export to arrive at a figure for which emission reductions will be claimed. From this will be deducted any project emissions, whilst these are not expected to arise modifications to the boiler and handling systems would permit coal to be combusted in the boiler. We have therefore included the parameters for the calculation of these emissions in the table on the next page

The carbon dioxide emission factor applied to the energy baseline is held constant throughout the life of the project and will therefore not be part of the monitoring plan.

ID number	Data type	Data variable	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)	For how long is archived data to be kept?	Comment
1	Quantity	EG_y	MWh	M	Daily	100%	Electronic	2 years after end of crediting period	Net electricity exported to grid

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

>>

The main aspect of quality control and quality assurance is the measurement of the renewable electricity export to grid. This will be carried out through the daily measurement of the electricity exported to the grid. This electricity meter reading can be cross checked with the Bihar State Electricity Board (BSEB) electricity meter that will simultaneously record the electricity export to grid. The monthly sales receipts of electricity will be based on these readings.

The electricity meters in the plant used for the measurement are regularly calibrated. This practice will continue after the project implementation.

The consumption of fossil fuel will be a cost to the plant and therefore records of purchases will be held by the commercial and accounting departments if such action is taken in the future to combust coal.

All data will be kept for a minimum of 2 years following issuance of certified emission reductions or the end of the crediting period, whichever is later, and this will be the responsibility of the project developers.

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:

>>

The electricity readings will be monitored on a daily basis compiled in the form of daily energy report. This report will be compiled form the data gathered form the hourly log sheets maintained in the cogeneration plant. The hourly log sheets will maintain the data for electricity generation, consumption in the auxiliaries and export to grid. These readings will be compiled in the form of daily energy report. The daily reports will be used collectively to prepare a monthly report. The monthly reports will be used to determine the monthly emission reductions. The monthly energy report along with the emission reductions will become a part of the Management Information System.

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

>>

Ben Atkinson, Contact details as listed in Annex 1.
Charu Gupta, Contact details as listed in Annex 1.
A.K. Aggarwal, Contact details as listed in Annex 1.

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

>>
As per appendix B the emission reductions for Type ID projects that generate renewable electricity are calculated as the product of energy baseline and the CO_2 emission coefficient for the fuel displaced.

E.1.1 Selected formulae as provided in appendix B:

>>
As per appendix B the emission reductions for Type ID projects that generate renewable electricity are calculated as the product of energy baseline and the CO_2 emission coefficient for the fuel displaced.

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:

>>
This section has been left blank on purpose

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

>>
This section has been left blank on purpose

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

>>
This section has been left blank on purpose

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:

>>
Baseline emissions are calculated from the energy baseline and CO_2 emission coefficient for the fuel displaced as shown in the following equations.

$$BE_y = EG_y . EF_y \qquad \text{Equation 2a}$$

Where:

BE_y = Baseline Emissions in year y, tCO_2e
EG_y = Net electricity exported in year y, MWh
EF_y = Carbon dioxide emissions factor, tCO_2e/MWh

Using the fixed carbon dioxide emissions factor determined in section B5, this equation may be simplified to the following:

$BE_y = 0.924.\ EG_y$ Equation 2b

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:

>>

$ER_y = BE_y$ Equation 3

Where:

ER_y = Emissions reductions generated in year y, tCO_2e
BE_y = Baseline Emissions in year y, tCO_2e

Substituting from equation 2b equation 3 reduces to

$ER_y = 0.924.\ EG_y$ Equation 3a

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

>>

Year	Estimation of project activity emission reductions (tonnes of CO_2 e)	Estimation of baseline emission reductions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO_2 e)	Estimation of emission reductions (tonnes of CO_2 e)
2006	0	11,975	0	11,975
2007	0	11,975	0	11,975
2008	0	11,975	0	11,975
2009	0	11,975	0	11,975
2010	0	11,975	0	11,975
2011	0	11,975	0	11,975
2012	0	11,975	0	11,975
2013	0	11,975	0	11,975
2014	0	11,975	0	11,975
2015	0	11,975	0	11,975
Total	**0**	**119,750**	**0**	**119,750**

SECTION F.: Environmental impacts:

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

>>

There are no negative environmental impacts arising as a result of the project activity. The positive environmental impacts arising from the project activity are:

- Reduced carbon dioxide emissions because of displacement of fossil fuel dominated grid electricity by biomass based renewable electricity.
- Reduced NOx and SOx emissions that arise from the combustion of coal in power generation
- Reduced generation of ash as the biomass used has a lower ash content than that of Indian coal, coal typically has an ash content of 30 to 40% whilst bagasse has an ash content ranging from 1% to 2%.

The project will be required to receive "consent to operate" and "approval to operate" from the Bihar Pollution Control Board (BPCB). These approvals will be made available to the DOE at the time of validation or verification.

Each year the plant will obtain a consent from the Bihar Pollution Control Board (BPCB) for air and water pollution. These consents will be monitored as part of the overall CDM process and compliance will be reported at annual verifications.

SECTION G. Stakeholders' comments:

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

>>
The local population and the cane growers/farmers are considered the major stakeholders with respect to the project activity. The consent of the local stakeholders will be sought by:

1. Publishing a notification of the project activity in a local news paper.
2. Organising a stakeholder meeting at the sugar mill and inviting members of the local community (village "*sarpanch*", leaders/members of local bodies and local residents).

The other stakeholders consulted are the Bihar Pollution Control Board and the Bihar Power Corporation Ltd.

A national stakeholder review will be done through approval from the Ministry of Environment and Forests, the Designated National Authority. An international stakeholder review will be done at the time of validation.

G.2. Summary of the comments received:

>>
To date no adverse comments have been received.

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

>>
Details from the proceedings of the stakeholders meeting will be provided at the time of validation.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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<u>Annex 2</u>

INFORMATION REGARDING PUBLIC FUNDING

The project has not received any public funding.

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