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

CONTENTS

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

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

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Renewable energy based Cogeneration project at Shreyans Industries Limited (SIL), Ahmedgarh, District Sangrur, Punjab.

Version 01,

September 19, 2006

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

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Purpose

SIL is engaged in the energy intensive business of paper manufacturing. Paper manufacturing is a continuous process with requirement of thermal as well as electrical energy for Pulp mill, chemical recovery and paper making processes. The purpose of the project activity is to have combined heat and power (CHP) generation (cogeneration facility) to meet the energy requirements and improve the overall energy efficiency of the manufacturing facility.

Pre Project Scenario - The manufacturing facility's requirement of thermal energy is being met with the rice husk fired boilers and the electrical demand by supply from Punjab state electricity board (PSEB).

Post Project Scenario – The proposed project activity, 3.5 MW cogeneration plant would fulfil the thermal and electrical requirements of the manufacturing facility. The cogeneration project would displace the supply from grid and thereby reduces the associated greenhouse gas (GHG) emissions. The fuel being used in the project activity is rice husk and biogas generated in the up flow anaerobic sludge blanket (UASB) digesters. The total heat and power output from the cogeneration project would be consumed by the manufacturing facility. The usage of a carbon neutral fuel (rice husk and biogas) for combined heat and power results in GHG reduction which would have happened due to the burning of fossil fuel in grid connected power units.

Biomass Availability

In the pre-project scenario, rice husk was procured from the rice shellers operating in Sangrur and nearby districts. The farmers who went in for manual de-husking of rice could not realize any financial benefits from the rice husk. Over a period of time the number of rice shelling units has increased in the region and thus the availability of rice husk has improved considerably.

The total food grain production in Punjab has increased many folds during last few decades. The production of rice which was 65.06 lakh metric tons in 1990-91 has increased to 96.56 lakh metric tons in

2003-04 showing an increase of 48%[1]. Considering 22 percent rice husk generation from paddy crop the total rice husk potential in state is 21.24 lakh metric tons. Biogas for the project plant would be supplied from anaerobic digesters at SIL plant.

Project Activity's contribution to Sustainable Development

The 1992 Earth Summit recognized the important role that indicators can play in helping countries to make informed decisions concerning sustainable development[2]. This recognition is articulated in Chapter 40 of Agenda 21 which calls on countries at the national level, as well as international, governmental and non-governmental organizations to develop and identify indicators of sustainable development that can provide a solid basis for decision-making at all levels. The sustainable development indicators stipulated by the Government of India in the interim approval guidelines for CDM projects are as follows[3,4]:

- Social well being
- Economic well being
- Environmental well being
- Technological well being

The SIL project activity assists in achieving sustainable development as follows:

Social well being – The project activity would result in generation of direct and indirect employment to people around the project site, and results in improvement in the quality of life of people.

Economic well being – The project activity would result in reduced total energy consumption due to the increased efficiency achieved due to combined heat and power generation. Also it would increase productivity and improve profitability of SIL. The project activity would also help in reducing the dependence of host country on imported fossil fuels and thereby helping the Indian economy.

Environmental well being – The project activity helps in sustainable usage of natural resources. By replacing the electricity supplied from grid with rice husk fired boilers for power generation the project activity results in reduction in GHG emissions.

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[1] http://punjabgovt.nic.in/agriculture/statistics.HTM#Crops

[2] http://www.un.org/esa/sustdev/natlinfo/indicators/isdms2001/isd-ms2001isd.htm

[3] http://envfor.nic.in:80/divisions/ccd/cdm_iac.html

[4] http://envfor.nic.in/cdm/host_approval_criteria.htm

Technological well being – SIL project activity would employ high pressure boiler technology for power generation at its manufacturing unit which would set a role model for other paper units which normally use low pressure boilers for meeting process steam requirement.

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)	Party involved wishes to be considered as project participant (Yes/No)
India (host)	Shreyans Industries Limited	No

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

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

A.4.1.1. Host Party(ies):

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India

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

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Punjab

A.4.1.3. City/Town/Community etc:

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Ahmedgarh, District Sangrur

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 project activity is located within premises of paper manufacturing unit of SIL at Ahmedgarh village in Sangrur district in Punjab. The nearest airport is located at Ludhiana which is about 35 Km from the plant site. The nearest railway station at Ahmedgarh is about 3 Km from the plant. The geographic location of the plant is depicted in the following map.

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

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Sectoral Scope:

1 – Energy industries (renewable/non-renewable sources)

Main Category :

Type I – Renewable energy projects

Sub – Category :

D – Grid connected renewable electricity generation

This category comprises renewable energy technologies that supply electricity to an electricity distribution system that is or would have been supplied by at least one fossil fuel or non-renewable biomass fired generating unit.

Biomass-based co-generating systems that supply electricity to a grid are included in this category. For co-generation systems and/or co-fired systems to qualify under this category, the energy output shall not exceed 45 $MW_{thermal}$. E.g., for a biomass based co-generating system the rating for all the boilers combined shall not exceed 45 $MW_{thermal}$. This project activity is a renewable energy based cogeneration project to produce heat (steam) and electricity for on-site use. It clearly qualifies in the above category since the rating of the boiler is less than the stipulated limit as shown below:

Boiler Capacity:	45 TPH
	12.5 kg/s (= 45 *1000/3600)
Energy of steam:	3231 kJ/kg (at 44Kg/cm^2 pressure and 410 °C temperature)
	3.231 MJ/kg
Energy of water (at 45 °C)	188 kJ/kg
	0.188 MJ/kg
Boiler rating:	12.5*(3.231 – 0.188)
	38.04 $MW_{thermal} < 45\ MW_{thermal}$

Technology of project activity

The project activity is a renewable energy based cogeneration plant wherein high-pressure steam turbine configuration would be used. Fluidized Bed Combustion (FBC) technology would be used for generating steam, which represents the best available technology as compared to pile burning and stoker fired boilers[5]. Since there is requirement of steam as well as power at the manufacturing set-up, so extraction cum condensing turbine would be the best option for the project. The project activity would also have an electrostatic precipitator to control the emissions arising due to the combustions. No technology transfer is involved due to the project activity to host country because technology is available within India from reputed manufacturers. The specifications of the systems in the project activity are as follows:

Boiler

Type:	Atmospheric Fluidized Bed Combustion (AFBC) Boiler
Pressure:	44 kg/cm^2
Temperature:	410 °C
Capacity:	45 tph
Fuel:	Rice Husk and biogas

Turbine

Type:	Multistage, Extraction cum condensing turbine, Horizontal, Impulse type
Capacity:	3.5 MW

[5] http://www.nrdcindia.com/pages/fbc.htm

Inlet steam pressure: 42 kg/cm^2

Temperature: 405± 5 °C

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 project activity would replace the fossil fuel consumed by power plants connected to the grid system with a carbon neutral fuel (rice husk and biogas) for power generation. Thus the GHG emissions which would have produced from fossil fuel fired power units in absence of the project plant are avoided.

There is no policy or regulation existent in the state which requires mandatory power generation by the use of renewable energy sources.

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

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Years	**Annual Estimation of emission reduction in tonnes of CO_2e**
2007-2008	19,911
2008-2009	19,911
2009-2010	19,911
2010-2011	19,911
2011-2012	19,911
2012-2013	19,911
2013-2014	19,911
2014-2015	19,911
2015-2016	19,911
2016-2017	19,911
Total estimated reductions (tonnes of CO_2e)	**199,110**
Total number of crediting years	**10 years**
Annual Average over the crediting period of estimated reduction (tonnes of CO_2e)	**19,911**

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

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No public funding as part of project financing from parties included in Annex I of the convention is involved in 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 of the indicative simplified modalities and procedure for small scale CDM project activity. A project activity is considered to be a debundled component of large project activity if there is a registered small scale CDM project or request for registration by another small scale project activity

- By 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.

Since above points are not applicable in case of SIL project activity, it can be said that the small scale project activity of SIL is not a debundled component of a large project activity, hence eligible to use simplified baseline and monitoring methodology.

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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Main Category:

Type I – Renewable energy power project

Sub – Category:

D – Grid connected renewable electricity generation

The reference has been taken from the methodology applicable for small-scale CDM project activity. AMS-I.D.

Version 09, 28th July 2006

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

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As per indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories the proposed project falls under the Category - Grid connected renewable electricity generation. It has been demonstrated earlier in section A.4.2 that the project meets the applicability conditions.

The pre-project scenario involves steam generation for the process by rice husk based boilers and electricity supplied from PSEB grid. In post project scenario the heat and electricity requirement of the plant would be met by supply from renewable energy based cogeneration unit.

As per paragraph 9 (Type 1.D.) - For other (grid connected in this case) system the baseline is kWh produced by renewable generating unit multiplied by an emission coefficient calculated in a transparent and conservative manner. Emission factor has been calculated as per the guidelines given in the methodology Type I.D as average of approximate operating margin and the build margin. The emission factor for northern regional grid is **0.896 kg of CO_2/kWh.**

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 accordance with paragraph 28 of the simplified modalities and procedures for small-scale CDM project activities, a simplified baseline and monitoring methodology listed in Appendix B may be used for a small-scale CDM project activity if project participants are able to demonstrate to a designated
operational entity that the project activity would otherwise not be implemented due to the existence of one or more barrier(s) listed in Attachment A to Appendix B.

The project activity of SIL faces barrier elaborated in the following paragraphs and hence would not implement in absence of CDM.

Investment Barrier

SIL paper manufacturing unit at Ahmedgarh was incurring losses in operations due to very high debt burden at time when project was envisaged. Company's debts were restructured under corporate debt restructuring scheme (CDR) and companies operations were reviewed by a Monitoring committee (MC) formed by CDR cell comprising of company's banker. SIL management put forward idea of putting up a cogeneration plant to MC, although MC did not reject the proposal, they refused to fund this project[6].

SIL management faced problem in procuring the debt finance for the project plant, since MC, which comprises of main bankers and financers of SIL were not willing to finance the project. Bank approached by SIL refused to finance the proposed project activity and promoter's equity has to put in for financing the major capital expenditure of the project.

Unavailability of funds for financing the project activity proved a major barrier in its implementation. SIL management despite of this hurdle decided to move ahead with the project considering CDM benefits in form of saleable credits (CER) which may accrue on successful registration of the project activity.

Technological Barrier

Although Government of India has promoted use of renewable energy sources for electricity generation technological risks associated with its usage hampers its widespread usage in the country.Rice husk ash contains high percentage of silica which leads to rapid erosion of the equipments. Due to high silica content and the pointed nature of the rice husk (biomass) particle, the equipment like ID fan, cone portion of air pre-heater and top portion of the stack would be eroded and lead to high maintenance cost, frequent breakdown and increased downtime. Presence of silica in rice husk ash also corrodes boiler tubes which require frequent maintenance of the boiler.

Further, in rice husk fired boilers, there will be escape of fluidized media along with flue gas. To compensate this and to maintain fluidized bed thickness, it is required to add fluidizing media at regular

[6] Minutes of meeting of MC are available with SIL for verification by DOE.

intervals. This will lead to variation in the air requirement. And also the fuel flow control with respect to the steam output is difficult in biomass fired boilers. Hence, the operation & control of biomass fired boiler requires skilled boiler operators.

Biogas generated in UASB digesters shall also be used as fuel for generating steam in the boiler. Presence of hydrogen sulphide in biogas, which gets generated in anaerobic conditions, makes biogas corrosive this may ultimately lead to corrosion of boiler tubes and other equipments. Desulphurization unit installation to remove hydrogen sulphide requires additional cost which may further prove as a barrier since SIL faced problem while procuring funds for the project activity.

Despite all this, the project proponent is keen to take up this biomass cogeneration project hoping that carbon credits will help them to overcome these barriers.

Other Barriers

Fuel Handling and storage

Due to cyclic nature of biomass generation sufficient storage would be required so as to maintain constant supply of fuel for project plant through out the year. Rice husk due to its low bulk density require large storage area which incurs additional cost for constructing storage area. If project proponent chooses to store rice husk in open, it has to face problems associated with seasonal variation like wetting of husk during monsoon and increase of suspended particulate matter in ambient air during winds.

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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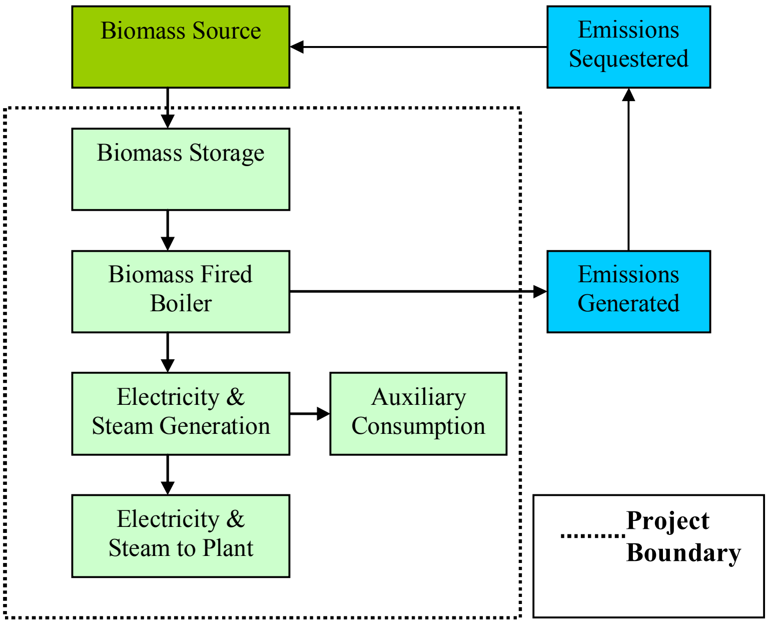
As per the guidelines, mentioned in paragraph 6 of Type I.D. project boundary is delineated by the physical and geographical site of the renewable generation source.

For the proposed project activity the project boundary is from the point of fuel storage to the point of electricity supply to the paper mill where the project proponent has a full control. Thus, project boundary covers fuel storage, boiler, steam turbine generator and all other accessory equipments. The project boundary is illustrated in the following diagram:



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

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B.5.1. The baseline for the proposed project activity has been arrived at using the methodology specified in the applicable project category for small-scale CDM projects.

Baseline data

Carbon emission factor of grid

The emission coefficient for the electricity displaced is calculated in accordance with provisions of paragraph 9 of Type I Category D of 'Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories - version 09, 28th July 2006'. Northern region's present generation mix, thermal efficiency, and emission co-efficient are used to estimate the net carbon intensity/baseline factor of the chosen grid.

The emission coefficient (measured in kg CO_2equ/kWh) is calculated in a transparent and conservative manner as:

(a) The average of the "approximate operating margin" and the "build margin" (or combined margin)

OR

(b) The weighted average emissions (in kg CO_2equ/kWh) of the current generation mix.

Complete analysis of the electricity generation has been carried out for the calculation of the emission coefficient as per paragraph 9 (a) given above.

Combined Margin

The baseline methodology suggests that the project activity will have an effect on both the operating margin (i.e. the present power generation sources of the grid, weighted according to the actual participation in the grid mix) and the build margin (i.e. weighted average emissions of recent capacity additions) of the selected grid and the baseline emission factor would therefore incorporate an average of both these elements.

Operating Margin

The "approximate operating margin" is defined as the weighted average emissions (in kg CO_2equ/kWh) of all generating sources serving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation;

The project activity would have some effect on the operating margin of the Northern region grid. The carbon emission factor as per the operating margin takes into consideration the power generation mix of 2003-2004, 2004-2005 and 2005-2006 excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation of the selected grid, and the default value of emission factors of the fuel used for power generation.

Average efficiency of gas turbines in combined cycle works out to be 45%. Standard emission factors given in IPCC for coal and gas (thermal generation) are applied over the expected generation mix and net emission factor is determined. Carbon Emission Factor of grid as per operating margin is 1.113 kg CO_2/kWh electricity generation.

Build Margin

The "build margin" emission factor is calculated by taking the weighted average emissions (in kg CO_2equ/kWh) of recent capacity additions to the system, which capacity additions are defined as the greater (in MWh) of most recent 20% of existing plants or the 5 most recent plants.

The project activity will have some effect on the build margin of the Northern region grid. The baseline factor as per the build margin takes into consideration the delay effect on the future projects and assumes that the past trend will continue in the future. Capacity additions of most recent 20 % of existing plants is greater than (in MWh) 5 most recent plants hence, for our build margin calculation we have taken into consideration 20 % of most recent plants built in Northern region given below. The key parameters for calculating build margin have been assumed same as that for calculating operating margin. Carbon Emission Factor of grid as per build margin is 0.679 kg CO_2/kWh electricity generation.

Net Carbon Emission Factor of Grid as per combined margin = (OM + BM)/2 = **0.896 kg of CO_2 / kWh generation**.

Key elements to determine baseline for the project activity

The key elements such as variables, parameters and data sources used to determine the baseline for the project activity are tabulated below:

S No.	Key Parameters	Data Sources	Reference
1	Generation of power of all the plants for the year 2001-02, 2002-03, 2003-04, 2004-05 and 2005-06	Annual reports of Northern Region Load Dispatch Center (NRLDC) 2001-02 and 2002-03 Section 7.1, Annual reports of Northern region Electricity Board (NREB) 2003-04 – Annex-10.1.3 2004-05 – Annexure 2.7 2005-06	http://www.nrldc.org/docs/7-1.pdf http://www.nrldc.org/docs/2001-02-section5onwards.pdf http://nreb.nic.in/Reports/Index.htm
2	Coal consumption of each coal fired power plant for the year 2003-04, 2004-05 and 2005-06	Annual Performance review of Thermal power plant (CEA)	www.cea.nic.in
3	Calorific value of coal	NATCOM Report	http://www.natcomindia.org/natcomreport.htm
4	Calorific value of gas	Revised 1996 IPCC Guidelines for National Green house Gas Inventories: Reference Manual	www.ipcc.ch
5	Oxidation factors	Revised 1996 IPCC Guidelines for National Green house Gas Inventories: Reference Manual	www.ipcc.ch
6	Efficiency of gas based power plants supplying power to grid	MNES study titled "Baselines for Renewable Energy Projects under Clean Development Mechanism". Chapter 2,	http://mnes.nic.in/baselinepdfs/chapter2.pdf
7	Emission factor of natural gas,	Revised 1996 IPCC Guidelines for National Green house Gas Inventories: Reference Manual	Refer Note
8	Emission factor of non-coking coal	NATCOM Report, Chapter 2, page 37	http://www.natcomindia.org/pdfs/chapter2.pdf
9	Emission factor of Eastern and Western grids	MNES study titled "Baselines for Renewable Energy Projects under Clean Development Mechanism". Chapter 2, Table 2.11b, Table 2.11d	http://mnes.nic.in/baselinepdfs/chapter2.pdf

Note:

The value of emission factors are given in terms of carbon unit in Revised 1996 IPCC Guidelines for National Green house Gas Inventories: Reference Manual. It is converted in terms of CO_2 as shown below:

Fuel	Emission factor	Emission factor
	tC/TJ	tCO_2/TJ
Natural gas	15.3	56.1 (15.3 x 44/12)
Non Coking Coal	26.13	95.8 (26.13 x 44/12)

Generation details

The power generation of power plants falls under Northern grid region for the past three years is given below:

Name	Type	Fuel	Generation (2003-04) GWh	Generation (2004-05) GWh	Generation (2005-06) GWh
Anta GPS	Thermal	Gas	2775.92	2595.77	2806.84
Auriya GPS	Thermal	Gas	4247.41	4119.47	4281.67
Badarpur TPS	Thermal	Coal	5428.96	5462.78	5380.54
Bairasiul	Hydro	Hydel	687.79	689.67	790.97
Bhakra Complex	Hydro	Hydel	6956.9	4546.01	6838.78
Chamera HPS	Hydro	Hydel	2648.32	3452.25	3833.66
Dadri GPS	Thermal	Gas	5058.66	5527.71	5399.34
Dadri NCTPS	Thermal	Coal	6181.12	6842.52	6768.09
Dehar	Hydro	Hydel	3299.29	3150.52	3122.68
Dhauliganga	Hydro	Hydel	-	-	312.46
Delhi	Thermal	Coal	1164.11	5203.8	1559.10
Delhi	Thermal	Gas	5159.77	4091.37	4046.11
Faridabad GPS	Thermal	Gas	2792.58	3172.01	2954.64
H.P.	Hydro	Hydel	3666.39	3666.39	2870.48
Haryana	Thermal	Coal	6849.26	7192.41	8352.58
Haryana	Hydro	Hydel	251.73	251.73	258.30
J&K	Hydro	Hydel	851.03	851.03	1133.41
J&K	Thermal	Gas	15.41	23.51	28.31
NAPS	Nuclear	Nuclear	2959.44	2760.01	2138.45
Pong	Hydro	Hydel	1178.93	882.57	1730.70
Punjab	Thermal	Coal	14118.96	14390.42	14848.73
Punjab	Hydro	Hydel	4420.43	4420.43	4999.36
Rajasthan	Thermal	Coal	15044.48	17330.79	19903.79
Rajasthan	Thermal	Gas	201.37	360.7	432.58
Rajasthan	Hydro	Hydel	494.07	494.07	921.33

RAPS-A	Nuclear	Nuclear	1293.37	1355.2	1267.50
RAPS-B	Nuclear	Nuclear	2904.68	2954.43	2815.73
Rihand STPS	Thermal	Coal	7949.26	7988.06	10554.73
Salal	Hydro	Hydel	3477.42	3443.29	3480.87
Singrauli STPS	Thermal	Coal	15643.4	15803.34	15502.80
SJVNL	Hydro	Hydel	1537.92	1617.45	3867.12
Tanakpur HPS	Hydro	Hydel	510.99	495.17	483.26
Tanda TPS	Thermal	Coal	2872.81	3254.67	3329.89
U.P.	Thermal	Coal	20638.05	19788.21	19326.44
U.P.	Hydro	Hydel	2063.04	2063.04	1244.92
Unchahar-I TPS	Thermal	Coal	3252.14	3342.83	3544.89
Unchahar-II TPS	Thermal	Coal	3187.93	3438.28	3501.21
Uri HPS	Hydro	Hydel	2873.54	2206.71	2724.81
Uttaranchal	Hydro	Hydel	3452.96	3452.96	3496.87
TOTAL			**168109.8**	**172681.6**	**180853.9**

Calculation of Operating Margin Emission Factor

The following table gives a step by step approach for calculating the Simple Operating Margin emission factor for Northern Regional electricity grid for the most recent 3 years at the time of PDD submission i.e.2003-2004, 2004-2005 & 2005-2006.

	2003-04	**2004-05**	**2005-06**
Generation by Coal out of Total Generation (GWh)	102704.29	106451.00	112572.8
Generation by Gas out of Total Generation (GWh)	20251.12	19890.00	19949.49
Imports from others			
Imports from WREB (GWh)	282.02	1602.84	2153.23
Imports from EREB (GWh)	2334.76	3600.58	4112.67

Fuel 1 : Coal	**2003-04**	**2004-05**	**2005-06**
Avg. Calorific Value of Coal used (kcal/kg)	4593	4593	4593
Coal consumption (tons/yr)	70,397,000	73,279,000	73,279,000
Emission Factor for Coal (tonne CO_2/TJ)	95.8	95.8	95.8
Oxidation Factor of Coal-IPCC standard value	0.98	0.98	0.98
COEF of Coal (tonneCO_2/ton of coal)	1.806	1.806	1.806
Fuel 2 : Gas			
Avg. Efficiency of power generation with gas as a fuel, %	45	45	50

Avg. Calorific Value of Gas used (kcal/kg)	10349	10349	10349
Estimated Gas consumption (tons/yr)	3,739,808	3,673,119	3684105.1
Emission Factor for Gas- IPCC standard value(tonne CO_2/TJ)	56.1	56.1	56.1
Oxidation Factor of Gas-IPCC standard value	0.995	0.995	0.995
COEF of Gas(tonneCO_2/ton of gas)	2.419	2.419	2.419
EF (WREB), tCO2/GWh	910.00	906.00	884.00
EF (EREB), tCO2/GWh	1186.00	1178.00	1158.00
EF (OM Simple), tCO_2/GWh	**1108.35**	**1116.65**	**1115.55**
Average EF (OM Simple), tCO_2/GWh			**1113.51**

List of power plants considered for calculating build margin

During 2005-06, the total power generation in northern grid region was 180,853.94 GWh. Twenty % of total generation is about 36,170.79 GWh. The recently commissioned power plant whose summation of power generation is about 37,608.63 GWh is considered for the calculation of Build margin. The list is tabulated below:

S. No.	Plant	Date of commissioning	MW	Generation of the unit in 2005-2006 (GWh)	Fuel Type
1	Dhauliganga unit-I	2005-2006	70	78.61	Hydro
2	Dhauliganga unit-II	2005-2006	70	78.61	Hydro
3	Dhauliganga unit-III	2005-2006	70	78.61	Hydro
4	Dhauliganga unit-IV	2005-2006	70	78.61	Hydro
5	Rihand Stage - II unit I	2004-2005	500	2593.70	Coal
6	Panipat # 7	2004-2005	250	921.46	Coal
7	Panipat # 8	2004-2005	250	1613.95	Coal
8	Chamera HEP-II (Unit 1)	2003-2004	100	567.67	Hydro
9	Chamera HEP-II (Unit 2)	2003-2004	100	567.67	Hydro
10	Chamera HEP-II (Unit 3)	2002-2003	100	567.67	Hydro
11	SJVPNL	2003-2004	1500	4104.25	Hydro
12	Baspa-II (Unit 3)	2003-2004	100	389.87	Hydro
13	Suratgarh-III (Unit-5)	2003-2004	250	2033.40	Coal
14	Kota TPS-IV (Unit-6)	2003-2004	195	1695.70	Coal
15	Baspa-II (Unit 1 & 2)	2002-2003	200	779.74	Hydro
16	Pragati CCGT (Unit II)	2002-2003	104.6	728.29	Gas
17	Pragati CCGT (Unit III)	2002-2003	121.2	843.86	Gas
18	Ramgarh CCGT Stage -II (GT-2)	2002-2003	37.5	146.80	Gas

19	Ramgarh CCGT Stage -II (GT-2)	2002-2003	37.8	147.97	Gas
20	Upper Sindh Extn (HPS)(1)	2001-2002	35	68.52	Hydro
21	Suratgarh stage-II (3 & 4)	2001-2002	500	3844.81	Coal
22	Upper Sindh Stage II (2)	2001-2002	35	68.52	Hydro
23	Malana-1 & 2	2001-2002	86	337.79	Hydro
24	Panipat TPS Stage 4 (Unit-6)	2000-2001	210	1688.29	Coal
25	Chenani Stage III (1,2,3)	2000-2001	7.5	3.88	Hydro
26	Ghanvi HPS (2)	2000-2001	22.5	69.71	Hydro
27	RAPP (Unit-4)	2000-2001	220	1432.17	Nuclear
28	Ranjit Sagar (Unit-1,2,3,4)	2000-2001	600	2012.84	Hydro
29	Gumma HPS	2000-2001	3	6.59	Hydro
30	Faridabad CCGT (Unit 1) (NTPC)	2000-2001	144	986.70	Gas
31	Suratgarh TPS 2	1999-2000	250	2112.17	Coal
32	RAPS-B (2)	1999-2000	220	1432.17	Nuclear
33	Uppersindh-2 HPS #1	1999-2000	35	68.52	Hydro
34	Faridabad GPS 1 & 2 (NTPC)	1999-2000	286	1959.71	Gas
35	Unchahar-II TPS #2	1999-2000	210	1732.60	Coal
36	Unchahar-II TPS #1	1998-1999	210	1767.20	Coal

Built Margin Emission Factor is calculated as per the following table:

Considering 20% of Gross Generation		
Sector		
Thermal Coal Based	20003.28	
Thermal Gas Based	4813.33	
Hydro	9927.69	
Nuclear	2864.33	
Total	37608.63	
Built Margin	-	-
Fuel 1 : Coal		
Avg. calorific value of coal used in Northern Grid, kcal/kg		4593
Coal consumption, tons/yr		12952313
Emission factor for Coal,tonne CO_2/TJ		95.8
Oxidation factor of coal (IPCC standard value)		0.98
COEF of coal (tonneCO_2/ton of coal)		1.806
Fuel 2 : Gas		
Avg. efficiency of power generation with gas as a fuel, %		45
Avg. calorific value of gas used, kcal/kg		10349
Estimated gas consumption, tons/yr		888886
Emission factor for Gas (as per standard IPCC value)		56.1
Oxidation factor of gas (IPCC standard value)		0.995
COEF of gas(tonneCO_2/ton of gas)		2.419
EF (BM), tCO_2/GWh		**679.00**

Therefore the **net baseline emission factor** as per combined margin
(OM + BM)/2 = 0.896 kg CO_2/kWh.

The baseline emissions are the annual kWh generated by the project activity times emission coefficient of 0.896 kg CO_2/kWh.

Date of completion of the baseline in *DD/MM/YYYY*

25/08/2006

Name of person/entity determining the baseline:

Shreyans Industries Limited

The entity is also a project participant listed in Annex 1 of this document.

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:

>>
11/01/2006

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

>>
25 years

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

>>
The project activity will use the fixed crediting period.

C.2.1. Renewable crediting period:

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

>>
Not selected

C.2.1.2. Length of the first crediting period:

>>
Not selected

C.2.2. Fixed crediting period:

>>
10 years

C.2.2.1. Starting date:

>>
01/04/*2007*

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:

>>

Title: Monitoring Methodology for the category I D – Grid connected renewable electricity generation. Version 09, 28th July 2006

Reference: 'Paragraph 13' as provided in Type I.D. of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories.

Paragraph 13 states that monitoring shall consist of:

Metering the electricity generated by the renewable technology. In the case of co-fired plants, the amount of biomass and fossil fuel input shall be monitored.

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

>>

As per the provisions of paragraph 12 of Simplified Modalities and Procedures for Small Scale CDM Project Activities [FCCC/CP/2002/7/Add.3, English, Page 21] the "Project participants may use the simplified baseline and monitoring methodologies specified in appendix B for their project category" if they meet the applicability criteria of Small scale CDM project activity. Since the project activity is a small-scale CDM project of Type I.D category, the monitoring methodology and plan has been developed in line with the guidance provided in paragraph 13 of Type I.D.

The cogeneration project activity would displace electricity supply from the grid, therefore the aforesaid monitoring methodology will be applicable to this project activity and the electrical energy monitoring would be carried out as the calculation of the emission reductions is based on the electricity displaced.

Description of monitoring plan

The project activity will have separate meters to record the gross power produced and auxiliary power consumed. The monitoring and verification system would mainly comprise of these meters as far as power supplied to the manufacturing facility is concerned. The rice husk and biogas input would also to be monitored. All monitoring and control functions will be done as per the internally accepted standards of SIL. All instruments will be calibrated and marked at regular intervals so that the accuracy of measurement can be ensured all the time.

GHG Sources

Direct On-Site Emissions

Direct on-site emissions of the project activity arise from the combustion of rice husk and biogas in the boiler. These emissions mainly include CO_2. However, the CO_2 released is very less as compared to the amount of CO_2 sequestered during the growth of the rice, thereby making it a carbon neutral fuel.

Direct Off-Site Emissions

Direct off-site emissions in the project activity arise from the rice husk transport.

Indirect On-Site Emissions

The indirect on site GHG source is the consumption of energy and the emission of GHGs involved in the construction of rice husk based cogeneration plant. Considering the life of the cogeneration plant and the emissions to be avoided in the life span, emissions from the above-mentioned source is too small and hence neglected. No other indirect on-site emissions are anticipated from the project activity.

D.3 Data to be monitored:

>>

a) Parameters affecting the emission reduction potential of the project activity

ID No.	Data Variable	Data unit	Source of data	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	Total electricity generated	kWh	Electronic Power and Energy meter, Daily log books	M	Every 8 hours	Total	Paper	Crediting Period (CP)+2 years	Baseline calculations.
2	Auxiliary consumption	kWh	Electronic meter, Daily log books	M	Every 8 hours	Total	Paper	CP + 2 years	Baseline calculations.
3	Power supplied to plant	kWh	Daily log books	C	Every 8 hours	Total	Paper	CP+2 years	Baseline calculations

b) Fuel related parameters affecting the project activity

ID No.	Data variable	Data unit	Source of data	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	Rice husk quantity	MT	Invoice	M	Weekly	100%	Paper	CP+2 years	Project emissions
2	Rice husk calorific value	Kcal/kg	Test reports	M	-	Sample testing	Paper	CP+2 years	Project emissions
3	Bio gas quantity	M^3	Plant	M	Daily	100%	Paper	CP+2 years	Project emissions

4	Bio gas calorific value	Kcal/kg	Test reports	M	-	Sample testing	Paper	CP+2 years	Project emissions

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

>>

Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored. (data items in tables contained in section D.3 (a to b) above, as applicable)

Data	Uncertainty level of data (High/Medium/Low)	Are QA/QC procedures planned for these data?
D.3.(a)1	Low	This data shall be used for calculating baseline emissions
D.3.(a)2	Low	This data shall be used for calculating baseline emissions
D.3.(a)3	Low	This data shall be used for calculating baseline emissions
D.3.(b)1	Low	Data shall be used to confirm the quantity of rice husk fired.
D.3.(b)2	Low	Data shall be used to confirm the renewable energy input in the plant.
D.3.(b)3	Low	Data shall be used to confirm the quantity of biogas fired.
D.3.(b)4	Low	Data shall be used to confirm the renewable energy input in the plant.

Project Parameters affecting Emission Reduction

Fuel related parameters:

Quantity of rice husk used in the boiler as fuel

Quantity of rice husk would be estimated based upon total quantity of biomass purchased by SIL.

Operational Parameters of the power generating Unit

Total Electricity Generated

The total electricity generated by the cogeneration project will be measured in the plant premises to the best accuracy and will be monitored and recorded, on a continuous basis by the calibrated electronic power and energy meter of accuracy class I. The integrated readings are recorded on manual log book for every 8 hour shift. Eenergy meter would be re-calibrated periodically by external agencies accredited with National Accreditation Board for Testing & Calibration Laboratories, Department of Science & Technology, Govt. of India. Another meter will be installed by PSEB, which will be calibrated in the PSEB lab and sealed by PSEB officials at the time of installation. This meter could be used for cross verification of energy generated by project activity.

Auxiliary Consumption

The electricity consumed by plant auxiliaries will be recorded in the plant premises to the best accuracy. This will be monitored and recorded on a continuous basis by the electronic power and energy meters of accuracy class I. The integrated readings would be recorded on manual log book for every 8 hour shift. Energy meters would be re-calibrated periodically by external agencies accredited with National Accreditation Board for Testing & Calibration Laboratories, Department of Science & Technology, Govt. of India. The total quantum of electricity consumed by the auxiliaries would affect the total electricity supplied to the manufacturing facility and therefore the amount of GHG reductions.

Power exported to the manufacturing facility

It will be calculated based on deduction of auxiliary consumption from the total electricity generated.

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:

>>

SIL would ensure accuracy of the measurement system as follows:

- The shift in-charges are responsible for the hourly data recording of the relevant parameters and also the recording of the total energy generated for every 8 hour shift.
- Daily readings are aggregated into weekly and then to monthly readings.
- The finance department cross-checks the data provided by the electrical department once a month and prepares report on the same.
-
- Any discrepancy observed in the readings (based on the past data) is addressed promptly.
- The mechanical and electrical managers ensure that the data is properly archived.
- The managers are qualified technical personnel in relevant field. All the shift in-charges are well experienced and qualified.

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

>>

Shreyans Industries Limited. The entity is also a project participant as listed in Annex 1 of this document.

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

E.1.1 Selected formulae as provided in appendix B:

>>

Not applicable

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:

>>

Essentially there would be no GHG emissions due to the project activity within the project boundary because the fuel being used is rice husk and biogas. The GHG emission due to the burning of rice husk is negated by the sequestration done during the growth of rice, thereby making it a carbon neutral fuel. Thus there are no anthropogenic emissions due to the project activity within the project boundary.

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

>>

As prescribed in Category 1.D., leakage estimation is only required if renewable energy technology is equipment transferred from another activity or if equipment is transferred to other project activity. This does not apply to the project case. However, the only source of considerable GHG emissions which are attributable to the project activity lying outside the project boundary will be the emissions arising during the transportation of rice husk (This would also not be very significant as rice husk is abundantly available in the nearby vicinity, thereby not much transportation distance of rice husk is involved in the project activity). The same have been estimated below.

Emissions due to the transportation of Rice husk

Total rice husk required	93789	tonnes/year
Rice husk transported by truck	93789	tonnes/year
Rice husk load per truck	8	tonnes
Total number of Trips	11724	

Max distance between the Project site and collection centers	50	km
Consumption of diesel per trip (to and fro) (@ 4 km/ lit)	25	Liters
Total Diesel Consumption	293100	Liters
Calorific Value of Diesel	0.0000283	TJ/lit
Emission Factor for Diesel	74.1	tonnes of CO_2/TJ
Total Emissions due to transportation of Rice husk	**615**	**tCO_2**

Similar GHG emissions would also occur during the transportation of coal for the grid connected power plants in the baseline. Hence the net direct offsite GHG emissions would be neglected.

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

>>

There would be no project activity emissions.

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:

>>

The baseline emission is due the electricity displaced from the grid. The present power generation mix of northern region grid has been used to estimate the net baseline emission factor. It is estimated as per the guidelines given in the paragraph 9 of 'Indicative simplified baseline and monitoring methodology for selected small-scale CDM project activity - Type I - Category D - version 09 – 28th July 2006.

The emission coefficient has been calculated as '*the average of the approximate operating margin and the build margin*'**.**

The step-by-step calculation of base line emission is as follows:

STEP 1. Calculation of Operating Margin emission factor (EF_{OM})

$$EF_{OM,y} = \sum_{i,j} F_{i,j} \times COEF_{i,j} / \sum_j GEN_j$$

Where

$COEF_{i,j}$ - the CO_2 emission coefficient of fuel i (t CO_2 / mass or volume unit of the fuel),

GEN_j, - the electricity (MWh) delivered to the grid by source j

$F_{i,j}$ -the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j, calculated as given below

j - the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants

The CO_2 emission coefficient $COEF_i$ is estimated as

$$COEF_i = NCV_i \times EF_{CO_2,i} \times OXID_i$$

Where

NCV_i - the net calorific value (energy content) per mass or volume unit of a fuel i

$EF_{CO2,i}$ - the CO_2 emission factor per unit of energy of the fuel i

$OXID_i$ - the oxidation factor of the fuel

The OM emission factor ($EF_{OM,\,y}$) has been calculated ex-ante, separately for the most recent three years (2003-2004, 2004-2005 and 2005-2006) and an average value has been considered as the OM emission factor for the baseline ($EF_{OM,}$).

$$EF_{OM} = \sum EF_{OM,y} / 3$$

Where y represents the year

STEP 2. Calculation of the Build Margin emission factor ($EF_{BM,}$)

It is calculated as the generation-weighted average emission factor (t CO_2/MWh) of a sample of power plants m of grid, as follows:

$$EF_{BM} = \sum_{i,m} F_{i,m} \times COEF_{i,m} / \sum_m GEN_m$$

Where

$F_{i,m,}$ $COEF_{i,m}$ and GEN_m - are analogous to the variables described in OM method above for plants m.

The Build Margin emission factor EF_{BM} has been calculated as ex-ante based on the most recent information available on plants already built for sample group m of Northern region grid at the time of PDD submission. The sample group m consists of the recent 20 % of power plants supplying electricity to northern region grid, as it comprises of larger annual power generation.

Further, none of the power plant in the sample group has been registered as CDM project activities.

STEP 3. Calculation of the electricity baseline emission factor (EF_y)

It is calculated as the weighted average of the Operating Margin emission factor (EF $_{OM,}$) and the Build Margin emission factor (EF $_{BM,}$):

$$EF_y = W_{OM} \times EF_{OM} + W_{BM} \times EF_{BM}$$

where the weights W $_{OM}$ and W $_{BM}$, by default, are 50% (i.e., $W_{OM} = W_{BM} = 0.5$), and $EF_{OM,}$ and EF_{BM} are calculated as described in Steps 1 and 2 above and are expressed in t CO_2/MWh.

$$BE_y = EF_y \times EG_y$$

Where

BE_y - are the baseline emissions due to displacement of electricity during the year y in tons of CO_2

EG_y- is the net quantity of electricity generated by the project activity during the year y in MWh, and

EF $_y$- is the CO_2 baseline emission factor for the electricity displaced due to the project activity in tons CO_2/MWh.

In case, the same amount of electricity is generated by the grid mix, it adds to the emissions that are ultimately getting reduced by the project activity. Therefore, the baseline estimated using above methods / scenarios would represent the realistic anthropogenic emissions by sources that would have occurred in absence of the project activity.

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:

>>

Following formula is used to determine emission reduction

CO_2 emission reduction due to project activity	=	(Baseline emission)	-	(Project emissions)

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

>>

Emission Reductions

Year	Baseline Emission factor (kg CO_2/kWh)	Net Power produced (Million Units)	Baseline emissions (tonnes of CO_2)	Project emissions (tonnes of CO_2)	Emission reductions (tonnes of CO_2)
2006-2007	0.896	22.216	19911	0	19911
2007-2008	0.896	22.216	19911	0	19911
2008-2009	0.896	22.216	19911	0	19911
2009-2010	0.896	22.216	19911	0	19911
2010-2011	0.896	22.216	19911	0	19911
2011-2012	0.896	22.216	19911	0	19911
2012-2013	0.896	22.216	19911	0	19911
2013-2014	0.896	22.216	19911	0	19911
2014-2015	0.896	22.216	19911	0	19911
2015-2016	0.896	22.216	19911	0	19911
TOTAL	0.896	**222**	**199110**	0	**199110**

A carbon intensive energy equivalent of **‘222’ Million kWh (**emission factor as 0.896 kg CO_2e / kWh) for a period of 10 years would be replaced by generating power from the **3.5 MW** renewable energy based cogeneration plant which in turn will reduce **‘199110’ tonnes** of CO_2 emissions.

SECTION F.: Environmental impacts:

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

>>

The host party does not require documentation of environmental impacts to grant consent to establish to the project activity. SIL has applied to state authorities for obtaining consent for establishing the project in the form of "No Objection Certificate". Environmental impacts reported below have been identified due to the project activity and a mitigation plan to minimize the impacts has been drafted. No major impact has been envisaged due to the project activity.

Impacts during construction

Air Quality

During construction phase there will be increase in the quantity of suspended particulate matter in the ambient air due to loose construction material like sand, gravel, cement etc. and due to the movement of construction equipments.

Water Quality

During construction phase due to presence of loose construction material at site there may be an increase in quantity of suspended matter in waste water washed at site. The quantity of waste water would also increase due to temporary dwellings of construction workers at site.

Impact on Land use

There would be no impact on the land use pattern, since the site at which project plant would commission is within the premises of SIL and currently it is not used for any other purpose.

Ecological Impact

There has been no vegetation or trees which need to be felled during construction activity hence there would be no major impact on the ecology of the surroundings at site.

Impacts during operation

Air Quality

There would be no major impact on ambient air quality. Project proponent has proposed an Electrostatic precipitator to arrest suspended particles in the flue gas.

Impact on Land use

There would be no impact on land use at site due to operation of cogeneration plant.

Ecological Impact

There would be no impact on the ecology due to operation of the cogeneration plant.

Environmental Management Plan

Although no major environmental impact has been envisaged due to the project activity following plan has been made to mitigate the minor impacts.

- Construction Phase impacts are temporary and limited during construction period only.
- Temporary dwellings for construction worker at site should be provided with temporary lavatories so that waste water from site can be treated along with other waste water.
- During operation phase environmental equipments like ESP would be installed to minimize the suspended particulate matter in the flue gas.
- Plantation would be done along the premises of industry.

SECTION G. Stakeholders' comments:

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

>>

Stakeholder identified for the project activity include following:

- Local residents
- Employees of SIL
- Local municipality
- NGOs

SIL organised a meeting at its premises on 10/04/2006 to brief local stakeholders identified above about the project activity. Local language was used to communicate with stakeholders and project activity was briefed by SIL officials such that they can understand the activity and its associated impacts simply.

G.2. Summary of the comments received:

>>

SIL briefed stakeholders identified above, about the project activity in a meeting organized on 10.4.2006 at its premises in Ahmedgarh, Sangrur. List of participants attended the meeting and minutes of the meeting is available with SIL for verification by DOE. Stakeholders appreciated SIL efforts of putting a biomass based power plant which would generate direct and indirect employment for local residents.

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

>>

There were no major comments received from stakeholders on the project activity. Minutes of meeting were compiled and copy of it has been sent to human resource, R&D and other concerned departments of SIL.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding as part of project financing from Parties included in Annex 1 to the convention is involved in the project activity.

Appendix A

Abbreviations

AFBC	Atmospheric fluidized bed combustion
CO_2	Carbon dioxide
DG	Diesel Generator
GHG	Green House Gases
INR	Indian National Rupee
IPCC	Inter Governmental Panel on Climate Change
kg	Kilogram
km	Kilometre
kVA	Kilo Volt Ampere
kW	Kilowatt
kWh	Kilowatt - hour
MW	Mega Watt
PDD	Project design document
SIL	Shreyans Industries Limited
tph	Tonnes per hour
UNFCCC	United Nations Framework Convention on Climate Change