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:

>> 2.25 MW Rice Husk based cogeneration plant at Siddeshwari Industries Pvt Ltd
Version 04
22/02/2007

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

>>

Purpose

The purpose of the project activity is to utilize rice husk available in the region for effective generation of electricity for in-house consumption. The project activity is the 2.25 MW rice husk based cogeneration power plant generating electricity and steam for captive consumption. The project activity is helping in conservation of natural resources like coal and HSD.

Salient features of the project

Siddeshwari Industries Pvt Ltd (SIPL), manufacturer of craft paper is the promoter of the project activity. The major equipments of the project activity comprise of a new 2.25 MW condensing cum extraction turbine and one boiler. This cogeneration system replaced three existing Diesel generating (DG) set and one boiler.

Present Scenario

The total power requirement of the paper mill was being met by three nos of DG sets of total capacity 1750 KVA and total process steam requirement of around 5 TPH at 8 kg/cm^2 was being met by coal fired boiler.

Project Scenario

The project activity, which is a ‘carbon neutral fuel’ based cogeneration plant, generates electricity in addition to steam to meet SIPL’s captive electricity requirement thereby displacing power generation from DG sets. Apart from the electricity, project activity is saving the equivalent coal which otherwise would have been used for the steam generation in process plant. The new boiler is a high pressure boiler with 18 TPH steam production.

Project’s contribution to sustainable development

This project activity has good contribution towards sustainable development and addresses the key issues:
Environmental well-being

1. Substituting the electricity requirement from DG set by cogeneration scheme thereby eliminating the generation of equivalent quantum of electricity using conventional fuel HSD.
2. Conserving coal by avoiding the process steam generation from coal fired boiler.

3. Mitigating the emission of GHG (CO_2) as rice husk is a carbon neutral fuel.

Socio-economic well being
1. Saving the coal and HSD and allowing it to be diverted to other needy sections of the economy
2. Contributing to a small increase in the local employment by employing skilled and un-skilled personnel for operation and maintenance of the equipment.

Technological well being
1. Adopting an advanced and sustainable technology for long term benefits.

A.3. Project participants:

>>

Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host)	Siddeshwari Industries Pvt Ltd, Muzaffarnagar (UP) (Private)	No

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

>>

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

>>

The location of project activity site is shown in map below.


India
International boundary
State or union territory boundary
National capital
State or union territory capital
Road
Railroad
AFGHANISTAN
PAKISTAN
CHINA
NEPAL
BHUTAN
BANGLADESH
BURMA
SRI LANKA
New Delhi
UTTAR PRADESH
MADHYA PRADESH
MAHARASHTRA
Arabian Sea
Bay of Bengal
INDIAN OCEAN
MALDIVES
INDONESIA
MUZAFFARNAGAR
(Uttar Pradesh)
SAHARANPUR
Uttranchal
HARIDWAR
N
To Haridwar
To Deoband
To Roorkee
Jalalabad
Bidauli
Un
Thana Bhawan
Charthawal
Bubana Kalan
Chhapar
Sikri
BIJNOR
Baghra
Shamli
Banal
MUZAFFARNAGAR
Bohpa
Kairana
DELHI
Sisauli
Taoli
Jauli
Shahpur
Mansurpur
Upper Ganga Canal
Jansath
Khandla
Burhana
Miranpur
Khatauli
58
To Ghaziabad
MEERUT
To Meerut
National Highway
District Boundary
River
State Highway
Road
Railway Track
District Headquarter
Taluk Headquarter
Town

A.4.1.1. Host Party(ies):

>> India

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

>> Uttar Pradesh

A.4.1.3. City/Town/Community etc:

>>
8.6 K. M., Jansath Road
Muzaffarnagar 251 001,
Uttar Pradesh, India

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

>> The project activity site is located at Jansath Road in district Muzaffarnagar. The project site is located 8.6 km from the heart of city. The site is well connected with road and rail network. The latitude[1] and longitude for the district is 29.28 N and 77.44 E respectively.

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

>>
Type & Category
Main Category: Type I - Renewable energy power project
Sub Category: C – Thermal Energy for the User

As defined under *Appendix B of the simplified modalities and procedures for small-scale CDM project activities (Version 09, 23rd December 2006*, this category includes "**biomass based co-generating systems that produce heat and electricity for use on-site**". For co-generation 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 capacity for all the boilers affected by the project activity combined shall not exceed 45 MW thermal. This project activity clearly qualifies in the above category since the net thermal energy output from the project activity is approximately 17 MWthermal (< 45 MWthermal).

The power requirement for operating the process plant at SIPL is about 1.25 MW. Previously the power requirement was met by supplies from DG sets running on HSD. SIPL set up the rice husk based cogeneration plant to meet its steam and power requirement from captive sources. The electricity produced by the project activity replaced the electricity supplied from DG set running on HSD. The activity also replaced the steam being supplied from coal fired boiler with this cogeneration system.

Technology employed for the project activity

The plant installed one condensing cum extraction turbine along with 18 TPH high pressure boiler with steam parameters of 65 kg/cm^2 and 480 ^{o}C. This boiler is of modern design with fludised bed furnace

[1] http://www.mapsofindia.com/lat_long/uttarpradesh/uttarpradesh.htm

suitable for outdoor installation with water scrubber for dust collection. Uninterrupted flow of rice husk to the boiler enabled by a twin bunker system located in front of the boiler. In case of exigencies of biomass fuel scarcity, SIPL proposes to use coal as fuel. The plant has seven days storage capacity for rice husk.

Fuel Handling System: Rice husk is loaded in the twin type bunkers, installed near the boiler with the help of conveyor belts. One drag chain conveyor for each bunker is provided for mixing of fuel in the twin bunker.
For generating maximum of 100 % steaming capacity of the boiler at rated parameters, about 4 TPH of Rice husk (100 % Rice husk firing) is required.
The plant also has coal handling facilities with necessary crushers and conveyors to meet the requirement in case of exigencies of biomass fuel scarcity.

The plant has Distributed Control System (DCS)/Supervisory Control And Data Acquisition (SCADA) for operation and generates a gross output of 2250 kW at the generator terminals. The power generation in the cogeneration plant is at 440 V level.

No transfer of technology is involved to host country because technology is available within India from reputed manufacturers.

The plant is designed with all other auxiliary plant systems like:
1. Rice husk and coal handling system
2. Ash handling system
3. Air pollution control devices
4. Water system consists of following sub-systems:
5. Raw water system
6. Condensate system
7. Water treatment system
8. Service and potable water system
9. Compressed air system
10. Fire protection system
11. Complete electrical system for power plant including, instrumentation and control systems etc.

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

>>

The cogeneration plant reduces anthropogenic GHG emissions by displacing fossil fuel based electricity and steam generation with environmentally sustainable resource, rice husk (carbon neutral), which is a renewable biomass. The project activity leads to GHG on-site emissions in the form CO_2 from

combustion of rice husk which will be consumed by paddy plantations and other plant species, representing a cyclic process of carbon sequestration. Since, the rice husk contains only negligible quantities of other elements like Nitrogen, Sulphur *etc*. release of other GHGs are considered as negligible.

By installing the project activity the project proponent is reducing **19524 tons of CO_2** annually.

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

>> The GHG emission reductions for a 10 year crediting period for SIPL are provided in Table.

Emission reductions at SIPL

Year	**Annual estimation of emission reduction in tones of CO_2 e**
2007	19524
2008	19524
2009	19524
2010	19524
2011	19524
2012	19524
2013	19524
2014	19524
2015	19524
2016	19524
Total estimated reductions (tonnes CO_2 equ.)	**195240**
Total number of crediting years	**10 years**
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	**19524**

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

>> There is no public funding available in this project.

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

>> According to appendix C of simplified modalities and procedures for small-scale CDM project activities, '***debundling***' is defined as the fragmentation of a large project activity into smaller parts. A

small-scale project activity that is part of a large project activity is not eligible to use the simplified modalities and procedures for small-scale CDM project activities.

According to para 2 of appendix C[2]

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;
- 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

According to above-mentioned points of de-bundling, SIPL's project activity does not comply with above, therefore, considered as small scale CDM project activity.

[2] Appendix C to the simplified M&P for the small-scale CDM project activities, http://cdm.unfccc.int/Projects/pac/ssclistmeth.pdf

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:
C – Thermal Energy for the User

The reference has been taken from the recent list of the small-scale CDM project activity categories contained in Appendix B of the simplified M&P for small-scale CDM project activities. (Version 09, 23rd December 2006)

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

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This project falls under the "Type I: Renewable energy projects" and "Category I C: Thermal energy for the user". According to the methodology:

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 capacity for all the boilers affected by the project activity combined shall not exceed 45 MW $_{thermal}$. In the case of the co-fired system the installed capacity (specified for fossil fuel use) for each boiler affected by the project activity combined shall not exceed 45 MW $_{thermal}$.

The project activity at SIPL is rice husk (biomass) based cogeneration plant; having the capacity of 17 MW $_{\text{thermal}}$. The project activity qualifies applicability criteria for the I.C and is within the limit of 45 MW $_{\text{thermal}}$.

The project activity uses the baseline approach mentioned in para 6 and 7 of the AMS I.C :

For renewable energy technologies that displace technologies using fossil fuels, the simplified baseline is the fuel consumption of the technologies that would have been used in the absence of the project activity times an emission coefficient for the fossil fuel displaced. IPCC default values for emission coefficients may be used.

For renewable energy technologies that displace electricity the simplified baseline is the electricity consumption times the relevant emission factor calculated as described in category I.D.

The project proponent was using the electricity from HSD and steam from coal based plant in the pre project scenario. Due to rising cost of HSD project proponent has thought of the coal based cogeneration power plant. (The board resolution is submitted).

In the absence of the project activity the coal based cogeneration plant would be in operation due to well proven technology and cheaper in the cost. (Excel sheet for the cost is submitted)

Thus the project activity falls under the category AMS I.C and the baseline approach is applied for the case what would have been replaced (Electricity and steam from coal based cogeneration plant) and same as considered as baseline.

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 'Attachment A to Appendix B 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 of Appendix. B.

It is established here that the project activity has associated barriers to its implementation which would be overcome with the availability of carbon financing against a sale consideration of carbon credits that would be generated during project operation.

The alternatives for the project activity applicable with current laws and regulations:

1. Purchasing the electricity from the state grid: Purchasing electricity from grid is an alternative, but in current scenario it is not a feasible option as state grid is severely short of power supply. According to Uttar Pradesh Power Corporation Limited, grid has a peak supply deficit of 14.93% in year 2004-05[3].Hence it is not an economically viable option for power purchase.
2. Captive Co-generation unit using coal as fuel: Coal is the primary fuel for power generated in the state. More than 81% of total power generated[4] in the state is produced using coal. Coal is also an economical option for power generation as it does not face supply barriers. Price fluctuations of fuel are not high which makes it a less risky fuel option.
3. Captive Co-generation unit using biomass as primary fuel i.e. project activity: Propose plant location is situated in the agriculture belt of Uttar Pradesh. There is an abundant supply of crop residue (mainly rice-husk) in the region[5]. However in normal practice it is burned in inefficient & improper way or is left for rotting in the fields. Supply related constraints are evident by the fact that despite availability of good quality biomass, it is not used for power generation in the state. There are barriers prohibiting implementation of the project activity.

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[3] Annex-3: Demand-Supply situation in Uttar Pradesh- Source: UPPCL

[4] Installed Generation Capacity as on 31.01.2005- Ministry of Power Data, **powermin.nic.in**

[5] Based on Biomass assessment report of region that the availability of rice husk is more than 25% of the all the users.

Investment barrier

The main investment barriers for the project activity are discussed below:

1. The project participants are small scale paper manufacturing unit and an investment of this magnitude was impossible for it alone therefore it has approached financial institutions to finance the project (Please see the breakup of project financing below).
2. In an event of any technical failures or delay in the project activity there is a grave risk of interests building up and threatening the financial capacity of SIPL. The project activity actually got delayed by 6 months and project proponent pays additional interest on the money taken from bank.
3. After the success of this project activity it is natural that there will be similar projects which will push the biomass prices upwards. Therefore escalation of biomass prices due to increase in demand for this fuel could hamper the financial prospects of the project activity. The detailed analysis of the same is done in the section below.
4. Conceiving this project without CDM benefits would have been impossible. The CDM fund will help the project proponent to run the cogeneration plant smoothly in-spite of rising biomass prices. CDM funding to project participants would also encourage other paper industries to follow suit and thereby contribute towards GHG emission reduction.

The major investment barrier to the project is the perceived risk in case of reduced supply of rice husk or increased rice husk prices in future. Investors are worried that shortage in supply of rice husk in future, may lead to steep rise in prices of rice husk which might render the project financially unstable.

This is evident from the fact that the cost of rice husk during the financial closure was around INR 1,500-1600/ton, which has increased to more than INR 1800-1900/ton in a period of 6 months (an increase of 18.5 %). Current prevailing prices of rice husk are INR 2200/ton (15% more). This escalation in the rice husk prices was expected at the time of project conception and the same is expected to continue in future.

Financial analysis Rice husk		
Quantity of Rice husk required in a year	7500	Tons
Cost of Rice husk while conceptualization of project	1500	INR/tons
Expense for Rice husk	11250000	INR/year
Cost of rice husk after commissioning of project	2200	INR/tons
Expense for Rice husk	16500000	INR/year
Annual increase in expenditure due to increased cost of rice husk:	5250000	INR/year
Expected annual earnings from sale of CER (@ Euro 6/CER)	6794525	INR/year

As per the prevailing prices of CER (Euro 8/CER) the CDM fund will compensate the increase in the rice husk prices. This CDM fund is expected to increase in future and the rice husk price as well. The CDM

revenue will help to improve the sustainability of the project which will otherwise be rendered financially unstable. The coal based cogeneration project would not have been faced such barriers.

Comparison with coal based cogeneration project before the starting of project		
Quantity of Rice husk required in a year	7500	Tons
Calorific value of rice husk	3150	Kcal/kg
Calorific value of coal	4000	Kcal/kg
Cost of Rice husk	1500	INR/ton
Cost of coal	1400	INR/ton
Cost per million Kcal from Rice husk	476	INR/million Kcal
Cost per million Kcal from Coal	350	INR/million Kcal

The project proponent has taken secured and unsecured loans from banks and paying huge interest for the project. This interest is an additional burden on project proponent. The details of finance are as below:

Means of Finance	INR in millions
Loan from state bank of India	45
Equity shares	7.5
Unsecured loan	2.5
Internal accruals	6.5
Total	**61.5**

Project proponent is paying the money back at interest rate of 9.25%.

Due to high initial investment in starting the cogeneration plant and due to its associated financial risk mentioned above it was not possible for the project proponent to install rice husk based cogeneration power plant. The project proponent had an alternative to install coal based cogeneration plant which is risk free and cheaper option with respect to coal based power plant. In spite of these factors, SIPL is one such entrepreneur to initiate this GHG abatement project under Clean Development Mechanism. It is ascertained here that, if SIPL is successful in securing the proposed carbon financing, it will help in offsetting this barrier and encourage other entrepreneurs to come up with similar project activities.

Other Barriers

Energy is not a core business of SIPL. They are mainly manufacturers of craft paper. The rice husk based cogeneration project activity is a steep diversification from the core business fields to power sector economics, where the project proponent has to meet challenges of techno-commercial problems associated with the project activity.

Apart from this UP's paper industry does not have any incentive to invest in high efficiency biomass cogeneration for electricity generation. In such circumstances they will continue to use rice husk for in-efficient burning in low pressure boilers with no electricity generation.

Fuel Supply Barriers

Biomass, though abundant in supply, doesn't have proper logistics network for collection and delivery. In normal practice it burned in improper way or is left for rotting in the field. As per expectation, this has also been observed (Rice-husk procured in the plant in past one year) that biomass prices increase significantly due to increased demand in the power plant. This happens due to lack of proper collection mechanism and delivery of biomass, this leads to short-term shortage and thus increased prices.

This is a fuel availability risk, and to ensure continuous & economical fuel supply project participants will have to invest in developing a viable fuel supply mechanism.

The barriers discussed above are sufficient to hinder growth of the cogeneration plants in sector. While the country has a clean energy strategy, the reality is that coal will continue to dominate in the near term and the paper industry will burn coal in inefficient boilers unless financial incentives, such as carbon financing, exist.

This project activity is a renewable energy project with net zero CO_2 emission due to the carbon sequestration. Paddy re-grows at the same rate as it is being harvested, and acts as a sink for atmospheric carbon dioxide and the net flux of CO_2 to the atmosphere is zero. The project activity will save coal (which would have been used for coal based cogeneration plant). The estimated emission reduction from the project activity is **19524** ton/annum.

In view of the above mentioned prohibitive barriers and GHG emission reductions, it is understood that the project activity is additional.

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:

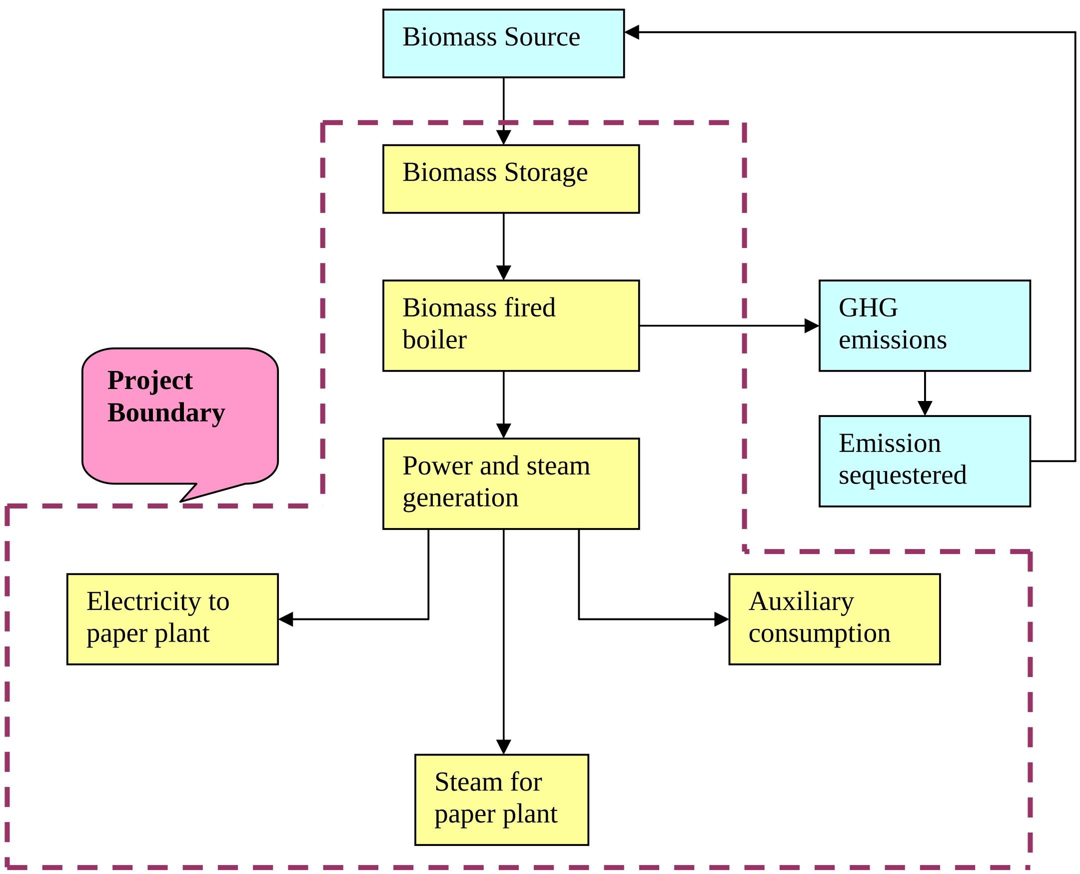
>>

As mentioned under Type I.C. of '*Appendix-B*[6] *of the simplified modalities and procedures for small scale CDM project activities*', project boundary encompasses 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 and steam 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.

6 Appendix B of the simplified modalities and procedures for small-scale CDM project activities, www.unfccc.int

Flow chart and project boundary is illustrated in the following diagram:



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

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B.5.1 Specify the baseline for the proposed project activity using a methodology specified in the applicable project category for small-scale CDM project activities contained in Appendix B of the simplified M&P for small-scale CDM project activities.

The coal based cogeneration, which would have been used in absence of project activity is considered as the baseline scenario. The baseline scenario is shown in table below:

Test 1

From Efficiency Test Run conducted on 07-01-2006

S. No.	Description	Units	Values
1	Actual plant power generation rate	kWh/hr	1331.5
2	Steam Flow rate from boiler	kg/hr	9625
3	Specific Steam Consumption	kg / kWh	7.2
4	Steam Pressure at Turbine inlet	kg / Sq. cm. (Abs)	64
5	Steam Temperature at Turbine inlet	degrees C.	476
6	BFW Temperature	degrees C.	116
7	Enthalpy of Steam at Turbine inlet	kcal / kg	802
8	Enthalpy of BFW	kcal / kg	116
9	Steam extracted from the plant	kg/hr	6958
10	Steam Pressure at Turbine extraction	kg / Sq. cm. (g)	4
11	Steam Temperature at Turbine extraction	degrees C.	238
12	Enthalpy of Steam at Turbine extraction	kcal / kg	702
13	Steam to condenser	kg/hr	2667
14	Steam Pressure at Turbine exhaust	kg / Sq. cm. (abs)	0.17
15	Plant heat rate	kcal / kWh	4960
16	Boiler Efficiency (assumed)	%	100
17	Overall Power Plant Efficiency	%	17
	Baseline Emissions (tCO_2/MWh)		
18	CO2 emission factor of coal used in captive power generation, IPCC	tC/TJ	26.2
19	Emission factor for captive power generation	tCO2/MWh	1.95

Test 2

From Efficiency Test Run conducted on 02-02-06

S. No.	Description	Units	Values
1	Actual plant power generation rate	kW	1360
2	Steam Flow rate from boiler	kg/hr	9750
3	Specific Steam Consumption	kg / kWh	7.2
4	Steam Pressure at Turbine inlet	kg / Sq. cm. (Abs)	64
5	Steam Temperature at Turbine inlet	degrees C.	447
6	BFW Temperature	degrees C.	118
7	Enthalpy of Steam at Turbine inlet	kcal / kg	785
8	Enthalpy of BFW	kcal / kg	118

9	Steam extracted from the plant	kg/hr	7208
10	Steam Pressure at Turbine extraction	kg / Sq. cm. (g)	4
11	Steam Temperature at Turbine extraction	degrees C.	243
12	Enthalpy of Steam at Turbine extraction	kcal / kg	704
13	Steam to condenser	kg/hr	2542
14	Steam Pressure at Turbine exhaust	kg / Sq. cm. (abs)	0.18
15	Plant heat rate	kcal / kWh	4783
16	Boiler Efficiency (assumed)	%	100
17	Overall Power Plant Efficiency	%	18
	Baseline Emissions (tCO_2/MWh)		
18	CO2 emission factor of coal used in captive power generation, IPCC	tC/TJ	26.2
19	Emission factor for captive power generation	tCO2/MWh	1.88

Test 3

From Efficiency Test Run conducted on 02-03-06

S. No.	Description	Units	Values
1	Actual plant power generation rate	kW	1306
2	Steam Flow rate from boiler	kg/hr	8750
3	Specific Steam Consumption	kg / kWh	6.7
4	Steam Pressure at Turbine inlet	kg / Sq. cm. (Abs)	64
5	Steam Temperature at Turbine inlet	degrees C.	448
6	BFW Temperature	degrees C.	100
7	Enthalpy of Steam at Turbine inlet	kcal / kg	786
8	Enthalpy of BFW	kcal / kg	100
9	Steam extracted from the plant	kg/hr	6458
10	Steam Pressure at Turbine extraction	kg / Sq. cm. (g)	4.1
11	Steam Temperature at Turbine extraction	degrees C.	258
12	Enthalpy of Steam at Turbine extraction	kcal / kg	712
13	Steam to condenser	kg/hr	2292
14	Steam Pressure at Turbine exhaust	kg / Sq. cm. (abs)	0.17
15	Plant heat rate	kcal / kWh	4596
16	Boiler Efficiency (assumed)	%	100
17	Overall Power Plant Efficiency	%	19
	Baseline Emissions (tCO_2/MWh)		

18	CO2 emission factor of coal used in captive power generation, IPCC	tC/TJ	26.2
19	Emission factor for captive power generation	tCO2/MWh	1.81

Test 4

From Efficiency Test Run conducted on 03-04-06

S. No.	Description	Units	Values
1	Actual plant power generation rate	kW	1387
2	Steam Flow rate from boiler	kg/hr	9625
3	Specific Steam Consumption	kg / kWh	6.9
4	Steam Pressure at Turbine inlet	kg / Sq. cm. (Abs)	64
5	Steam Temperature at Turbine inlet	degrees C.	443
6	BFW Temperature	degrees C.	118
7	Enthalpy of Steam at Turbine inlet	kcal / kg	783
8	Enthalpy of BFW	kcal / kg	118
9	Steam extracted from the plant	kg/hr	6958
10	Steam Pressure at Turbine extraction	kg / Sq. cm. (g)	4.1
11	Steam Temperature at Turbine extraction	degrees C.	252
12	Enthalpy of Steam at Turbine extraction	kcal / kg	709
13	Steam to condenser	kg/hr	2667
14	Steam Pressure at Turbine exhaust	kg / Sq. cm. (abs)	0.19
15	Plant heat rate	kcal / kWh	4613
16	Boiler Efficiency (assumed)	%	100
17	Overall Power Plant Efficiency	%	19
	Baseline Emissions (tCO_2/MWh)		
18	CO2 emission factor of coal used in captive power generation, IPCC	tC/TJ	26.2
19	Emission factor for captive power generation	tCO2/MWh	1.82

Test 5

From Efficiency Test Run conducted on 22-05-06

S. No.	Description	Units	Values
1	Actual plant power generation rate	kW	1421
2	Steam Flow rate from boiler	kg/hr	9708

3	Specific Steam Consumption	kg / kWh	6.8
4	Steam Pressure at Turbine inlet	kg / Sq. cm. (Abs)	64
5	Steam Temperature at Turbine inlet	degrees C.	472
6	BFW Temperature	degrees C.	116
7	Enthalpy of Steam at Turbine inlet	kcal / kg	800
8	Enthalpy of BFW	kcal / kg	116
9	Steam extracted from the plant	kg/hr	7000
10	Steam Pressure at Turbine extraction	kg / Sq. cm. (g)	4.1
11	Steam Temperature at Turbine extraction	degrees C.	246
12	Enthalpy of Steam at Turbine extraction	kcal / kg	706
13	Steam to condenser	kg/hr	2708
14	Steam Pressure at Turbine exhaust	kg / Sq. cm. (abs)	0.2
15	Plant heat rate	kcal / kWh	4672
16	Boiler Efficiency (assumed)	%	100
17	Overall Power Plant Efficiency	%	18
	Baseline Emissions (tCO_2/MWh)		
18	CO2 emission factor of coal used in captive power generation, IPCC	tC/TJ	26.2
19	Emission factor for captive power generation	tCO2/MWh	1.84

Remarks: The turbine is extraction cum condensing type. The plant heat rate is in the order of 5000 kcal/kWh because of the use of extracted steam. This value will be around 3000 kcal/kWh while operating on fully condensing mode. However with extraction cum condensing turbine, the energy in the extracted steam is not wasted, as it is utilised in the process.

The conservative emission factor 1.81 tCO2/MWh was selected as the baseline emission factor for the project activity and is fixed for the entire crediting period of the project.

B.5.2 Date of completing the final draft of this baseline section

30/05/2006

B.5.3 Name of person/entity determining the baseline:

Siddeshwari Industries Pvt Ltd, Muzaffarnagar (UP)

The person/entity is also a project participant as 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:

>> 27/05/2004 (Date of release of purchase order for the major equipments)

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

>> 25 Years 0 months

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

>>

C.2.1. Renewable crediting period:

>> Not Applicable

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

>>

C.2.1.2. Length of the first crediting period:

>>

C.2.2. Fixed crediting period:

>>

C.2.2.1. Starting date:

>> The crediting period will start after the registration of the project activity. For the calculation purposes the crediting period is considered from 1st January 2007

C.2.2.2. Length:

>> 10 years 0 months

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:

>>

Monitoring methodology / guideline mentioned in the '*Appendix B of the simplified modalities and procedures for small scale CDM project activities'* in the project category Type I.C. is considered as basis for monitoring methodology for the project activity. The document states that the monitoring shall consist of

Metering the thermal and electrical energy generated for co-generation projects. In the case of co-fired plants, the amount of fossil fuel input shall be monitored;

The same monitoring approach is adopted from the project activity.

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

>>

As established in Section A.4.2 the project activity falls under Category I.C. Generation of electricity for captive consumption using rice husk as fuel in SIPL's cogeneration plant will lead to mitigation of GHG emissions from the fossil fuel based plants, which supply steam and power to SIPL. In order to monitor the mitigation of GHG due to at the project activity at SIPL, the total electricity produced and auxiliary consumption need to be measured.

The baseline scenario for the project activity is the coal based cogeneration system. The baseline is established in terms of the actual plant operation from coal and the heat rate is calculated based on actual data.

The net electricity supplied to manufacturing facility of SIPL by the project activity multiplied by the heat rate and emission factor of the coal will form the baseline for the project activity.

The project activity is rice husk based cogeneration power plant and based on the methodology both steam and power should be monitored. In the cogeneration system the power is more important with respect to steam because the cogeneration system is meeting power demand first. Therefore steam is free. Direct monitoring of power generation will be most important for emission reduction calculation.

Based on the project activity this monitoring methodology is best suited for transparent and conservative emission reductions.

D.3 Data to be monitored:

>>

GHG SOURCES

Direct On-Site Emissions

Direct on-site emissions after implementation of the project arise from the combustion of biomass 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 taken up by the biomass during growing, therefore no net emissions occur. It is also demonstrated that the biomass availability is more that 25% of all the consumers and there will not be any leakage due to project activity.

Direct Off-Site Emissions

Direct off-site emissions in the proposed project arise from the biomass transport. The same type of CO_2 emission (leakage) occurs during transportation of coal from coal mines to SIPL. The distance between the coal mine and SIPL is much higher as compared to the average transportation distance considered between project site and biomass collection centers. Hence negative leakage emissions should occur due to project.

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 power 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.

The parameters which will be monitored in the project are given in table below:

ID number *(Please use numbers to ease cross-referencing to D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic / paper)	Comment
P.1	*Quantity electricity generated*	*Plant*	*kWh*	*Measured*	*Monthly*	*100%*	*Paper & Electronic*	*Instrument used: Energy meter, DM 5240, 4300/5A* *Range: 0-300 kW* *Make: Conserve energy systems* *Calibration: Annual* *Data archived: Crediting period + 2 yrs*
P.2	*Electricity consumption in the power plant*	*Plant*	*kWh*	*Measured*	*Monthly*	*100%*	*Paper & Electronic*	*Instrument used: Energy Meter, 3 phase, class 1, 415 V* *Make: L & T* *Calibration: Annual* *Data archived: Crediting period + 2 yrs*
P.3	*Quantity of steam used in power plant*	*Plant*	*TPD*	*Measured*	*Continuous recording & monthly reporting*	*100%*	*Paper & Electronic*	*Instrument used: Transmitter HART 2600 T With field communication protocol* *Range: 1500 mm WC* *Calibration: Annual* *Data archived: Crediting period + 2 yrs*
P.4	*Temperature of the steam*	*Plant*	*Deg C*	*Measured*	*Daily*	*100%*	*Paper and electronic*	*Instrument used: Temperature transmitters (600 T series) With K type of thermocouple* *Calibration: Annual* *Data archived: Crediting period + 2 yrs*
P.5	*Pressure of the steam*	*Plant*	*Kg/cm2*	*Measured*	*Daily*	*100%*	*Paper and electronic*	*Instrument used: Pressure transmitters (HART 2600T series)* *Calibration: Annual* *Data archived: Crediting period + 2 yrs*
P.6	*Enthalpy of steam*	*Plant*	*kCal/kg*	*Measured and*	*Continuous recording &*	*100%*	*Paper & Electronic*	*Calculated based on the pressure and temperature of steam, The pressure and*

ID number *(Please use numbers to ease cross-referencing to D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic / paper)	Comment
				calculated	*monthly reporting*			*temperature will be measured from the pressure and temperature transmitter (600 T series)* *Calibration: Annual* *Data archived: Crediting period + 2 yrs*
P.7	*Quantity of coal consumed*	*Plant*	*ton*	*Measured*	*Daily*	*100%*	*Paper & Electronic*	*Instrument used: Electronic weigh bridge* *Range: 80 tons* *Make: Leotronic scales Private limited.* *Calibration: Annual* *Data archived: Crediting period + 2 yrs* *Comment: Coal quantity should be measured when it is used in in system in project activity*
P.8	*Net calorific value of coal*	*Laboratory*	*Kcal/kg*	*Estimated*	*As and when required based on consignment of coal*	*100%*	*Paper & Electronic*	*This measurement will be done from any accredited laboratory.* *Data archived: Crediting period + 2 yrs*
P.9	*Emission factor of coal*	*IPCC*	*tCO2/TJ*	*Fixed*	*Once*	*100%*	*Paper anf electronics*	*IPCC default factor will be used for the emission factor of coal.* *Data archived: Crediting period + 2 yrs*

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 *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
P.1	*Low*	*Internal quality system is applicable for the electricity monitoring.*
P.2	*Low*	*Internal quality system is applicable for the electricity monitoring.*
P.3	*Low*	*Internal quality system is applicable for the steam monitoring.*
P.4	*Low*	*Internal quality system is applicable and data is inbuilt in the monitoring system..*
P.5	*Low*	*Internal quality system is applicable and data is inbuilt in the monitoring system.*
P.6	*Low*	*Calculated from the steam table.*
P.7	*Low*	*Internal quality system is applicable for the coal use.*
P.8	*Low*	*External accredited lab data.*
P.9	*Low*	*IPCC default value.*

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:

>>

Emission monitoring and calculation procedure will follow the following organisational structure. All data and calculation formula required to proceed is given in the section D in PDD.

Organisational structure for monitoring plan

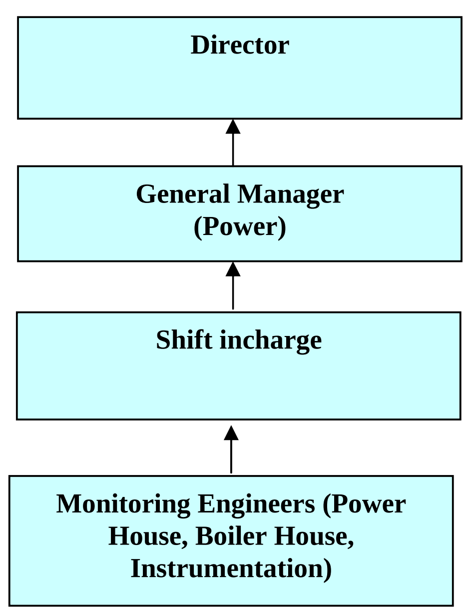

Table --: Monitoring and calculation activities and responsibility

Monitoring and calculation activities	Procedure and responsibility
Data source and collection	Data is taken from the power plant. Data will be monitored with the installed electronic data recording system.
Frequency	Monitoring frequency should be as per section D of PDD.
Internal Review	All received data is reviewed by the engineers in the power plant.
Data compilation	All the data is compiled and stored in power plant.
Emission calculation	Emission reduction calculations will be done annual based on the data collected. Engineers/Executives of power plant will do the calculations
Review	General Manager, power will review the calculation.
Emission data review	Final calculations is reviewed and approved by Director.
GHG performance and uncertainties assessment	The director will review the calculation and make the GHG performance review. The director will address the uncertainties as per inter procedure laid down for CDM project.
Record keeping	All calculation and data record will be kept with the power plant.

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

>>
Siddeshwari Industries Pvt Ltd, Muzaffarnagar (UP)

The person/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:

>>

Since category I.C. does not indicate a specific formula to calculate the GHG emission reduction by sources, the formula is described below in E.1.2

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:

>>

The project activity leads to GHG on-site emissions in the form of CO_2 emissions from combustion of rice husk. The CO_2 emissions from rice husk combustion process will be consumed by the paddy plantations, representing a cyclic process of carbon sequestration. Since the husk contains negligible quantities of other elements like Nitrogen, Sulphur etc. release of other GHG emissions are considered negligible.

GHG emissions during on-site construction work will be negligible and are not accounted for.

Similarly emissions associated with transportation of construction materials are ignored.

In case of exigencies of biomass fuel scarcity, SIPL proposes to use coal as fuel.

In case coal is used the CO2 emissions during the usage of coal will be calculated in the following manner:

Tonnes of CO_2 = Quantity of coal used in tonnes x Net calorific value of coal x CO_2 emission coefficient of coal in kg CO_2/TJ (IPCC value)

Diesel generator (DG) sets will be used as standby. However the emissions from the usage of DG sets are not considered in the project activity emissions since the electricity generated by DG sets would be monitored separately and not the part of the project activity. The electricity required to start-up the project in a year in comparison to total electricity generated is negligible.

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

>>

There is no technology transfer in project activity, therefore no leakage emissions are expected from project activity. The biomass is available in the nearby region to the project site and the coal mines are very long distant. Therefore the emission due to transportation for biomass can be assumed to be negligible.

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

>>

The emissions from the project due to use of coal (if any) would give the 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:

>>

1. Emissions from the electricity used in baseline

Emissions from electricity = Quantity of electricity generated (MWh) x Baseline emission factor (tCO2/MWh)

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 Activity emission

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

>>

Year	**Estimation of baseline emission reductions (tonnes of CO_2 e)**	**Estimation of project activity emission reductions (tonnes of CO_2 e)**	**Estimation of emission reductions (tonnes of CO_2 e)**
2007	19524	0	19524
2008	19524	0	19524
2009	19524	0	19524
2010	19524	0	19524
2011	19524	0	19524
2012	19524	0	19524
2013	19524	0	19524
2014	19524	0	19524
2015	19524	0	19524
2016	19524	0	19524
Total estimated reductions (tonnes CO_2 equ.)	**195240**	**0**	**195240**
Total no of Crediting Years	10 years	10 years	10 years
Annual average over the crediting	**19524**	**0**	**19524**

Year	Estimation of baseline emission reductions (tonnes of CO_2 e)	Estimation of project activity emission reductions (tonnes of CO_2 e)	Estimation of emission reductions (tonnes of CO_2 e)
period of estimated reductions (tonnes of CO_2 e)			

SECTION F.: Environmental impacts:

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

>>

The project does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India. However the design philosophy of this cogeneration project activity is driven by the concept of providing the low cost energy with acceptable impact on the environment hence the environment and safety aspects of the project activity can be are discussed as follows:

Particulate matter and gases

The elements polluting the air that are discharged from the Cogeneration power plant are,

1. Dust particulate from fly ash in flue gas
2. Nitrogen oxide in flue gas
3. Sulphur di-oxide in flue gas

Water scrubber is installed for the plant steam generator to contain the dust emission from plant to a level of less than 115 mg/Nm3. The water scrubber is designed such that the dust concentration at the ESP outlet will be 115 Mg/Nm3 even during the plant is fired by coal in future. Adequate height of the stack for the Rice husk fired boiler, which disburses the pollutants has been provided as per guidelines given by the pollution regulations for dust and sulphur-di-oxide emissions into the atmosphere.

The temperatures encountered in the boiler while burning the specified fuels, are low enough not to produce nitrogen-oxides. Hence, no separate measures are taken to contain the nitrogen oxide pollutants.

Dry fly ash

The ash will be collected manually by using Trolleys. The dry fly ash from the economiser, air heater and ESP hoppers will be collected by dense phase ash handling system and stored in ash bunker, will be used for land filling in the nearby lowland areas. Provision is made in the system for water spray to eliminate dust nuisance in the plant.

Wastewater

Effluent from water treatment plant: Hydrochloric acid and sodium hydroxide is used as regenerants in the water treatment plant. The acid and alkali effluent generated during the regeneration process of the ion-exchangers are drained into a lined underground neutralizing pit. Generally these effluents are self neutralizing. The effluent is then pumped into the effluent treatment ponds which form part of the main paper unit as well as cogeneration power plant's effluent disposal system. The neutralizing pit are sized with sufficient capacity. The rejects from plant has high TDS which could be diluted and used for cleaning purposes in the project activity. This water also could be used for plantation.

Chlorine in cooling water: In the condenser cooling water, residual chlorine of about 0.2 ppm is maintained at the condenser outlet. This chlorine dosing is done mainly to prevent biological growth in the cooling tower system. This value would not result in any chemical pollution of water and also meets the national standards for the liquid effluent.

Monitoring

The characteristics of the effluents from the plant are monitored and maintained to meet the requirements of State Pollution Control Board and the minimum national standards for effluent from thermal power plants. Air quality monitoring is also undertaken to ensure that the dust pollution level is within limits.

SECTION G. Stakeholders' comments:

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

>>

SIPL organised stakeholder consultation with the objective to inform the interested stakeholders on the environmental and social impacts of the project activity and discuss their concerns regarding the project activity.

SIPL representatives presented the salient features of the company and the project activity to the stakeholders and requested their suggestions/objections. The project proponent has sent the letters to different stakeholders for their views for the project activity. The opinions expressed by them were recorded and are available for validation.

The other stakeholders identified for the project activity are as under:

1. State Pollution Control Board
2. Consultants
3. Equipment suppliers

Stakeholders list includes the government and non-government parties, which are involved in the project activity at various stages. At the appropriate stage of the project development, stakeholders /relevant bodies would be involved to get the clearance.

G.2. Summary of the comments received:

>>

Stakeholders Involvement

The local community mainly comprises of local population around the project area. In addition to this, it also includes local manpower since; the project activity provides direct and indirect employment opportunities to local populace thus encouraging the project activity.

The project activity did not cause to any displacement or adverse social impacts on the local population and is helping in improving the quality of life for them.

State Pollution Control Board (SPCB) has prescribed standards of environmental compliance and monitor the adherence to the standards. SIPL has received NOC from SPCB.

Projects consultants were involved in the project activity to take care of the various pre contract and post contract issues / activities like preparation of basic and detailed engineering documents, preparation of tender documents, and selection of vendors / suppliers, supervision of project operation, implementation, successful commissioning and trial run.

The project proponent has received comments from local population in appreciation for such an effort on SIPL's part. They have no objection to the installation of the proposed cogeneration plant. The copies of the comments received from the stakeholders are available for validation.

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

>>

In view of various direct and indirect benefits (social, economical, environmental), no concerns were raised during the consultation with stakeholders, hence it is not required to take due account of the comments.

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 I of the convention is involved in the project activity.

Annex 3

Power scenario in UPPCL

UTTAR PRADESH-ENERGY & AVAILABILITY OF POWER BY THE END OF IX PLAN AND ONWARDS

Year	Energy Requirement/availability in Million Units						Peak Demand in MW			
	Energy Demand As per XVI EPS	Availability			Shortage		Peak Demand As per XVI EPS	Availability	Shortage	
		State Generation	Import	Total	In MU	(%)			in MW	(%)
2000-01	46763	22506	18505	41011	5752	12.30	7477	5648	1829	24.46
2001-02	50087	22814	19060	41874	8213	16.40	8018	5716	2302	28.71
2002-03	53671	23124	24633	47757	5914	11.02	8601	6889	1712	19.90
2003-04	57531	24607	26280	50887	6644	11.55	9230	7470	1760	19.07
2004-05	61681	24563	31910	56473	5208	8.44	9907	7994	1913	19.31
2005-06	66103	24563	40139	64702	1401	2.12	10626	9040	1586	14.93
2006-07	70803	26312	43189	69501	1302	1.84	11384	9967	1417	12.45

Source: UPPCL

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