CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

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>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

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

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Energy efficiency and fuel switching measures for industrial applications, Rajasthan
Versions 01
Date: 05/11/07

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

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DCM Shriram Industries Ltd. (DSIL) is the flagship company of the DCM Shriram Industrial Group. The group is based predominantly in Northern India, and has a portfolio of products comprising of sugar, alcohol, fine chemicals and industrial rayon tyre cord.

In the pre-project scenario in one of DSIL's units located at Kota, Rajasthan, which manufactures industrial rayon tyre cord and chemicals, 3coal fired boilers (3x27 tonnes per hour) along with 4MW condensing cum extraction type Steam Turbo Generator (STG) set and one 2MW condensing type Steam Turbo Generator (STG) set were used to meet the process steam requirement as well as to generate power to the tune of 6MW. The remaining power demand was met through the power import from the Rajasthan State Electricity Board grid as and when required.

The project activity involves the installation of the backpressure type Steam Turbo Generator set of 3MW capacity to generate additional power without increasing the overall steam requirement. In keeping with their commitment towards environmental sustainability, the company has also proposed to improve the overall powerhouse efficiency by installing a 42Kg/cm^2 28TPH Fluidised Bed Combustion (FBC) boiler with multi-fuel firing capability within the powerhouse.

Such efficiency improvement of the cogeneration system has enabled the project proponent to reduce the specific coal consumption for steam and power generation. Direct reduction in specific coal consumption for cogeneration system contributes to lower CO2 emissions:

- at the plant end due to lower coal consumption through higher generation efficiency
- at the plant end due to usage of agro fuel (20% blending of biomass)

These efficiency measures adopted in the unit are uncommon with respect to the prevailing practices in similar establishments.

The project activity deals with the 'Energy Efficiency' and partial displacement of fossil fuel components, which seek to improve the energy efficiency level by lowering the specific steam consumption, which is expected to yield a coal savings per year. Partial substitution of coal with biomass in new boiler also saves fossil fuel consumption which yields additional coal savings per year.

Project's Contribution to the Sustainable Development

The contribution of the project activity to the Host Country's sustainable development has been studied with respect to the all-encompassing aspects, as presented further,

Socio-Economic Well-Being: As a progressive and conscientious corporate citizen, DSIL is keenly aware of its social responsibilities. With the implementation of new technologies and refined operational methods, the employees will get a chance to enhance their skills and knowledge. Also, such exposures to progressive technologies will be beneficial to their self-confidence and increase their competency. Moreover, as the project activity promotes energy efficiency, it effectively helps to reduce the coal consumption, thereby alleviating the burden on the depleting natural resource, which may then be diverted to the other sections of the economy.

Environmental Well-Being: The energy efficiency measures reduce the specific energy consumption for thermal power generation. It directly reduces the facility's coal consumption. The reduction in coal consumption results in reduced emissions of carbon dioxide and of suspended particulate matter (SPM) from the combustion of the fuel, and reduced GHG emissions from the transportation and mining activity associated with supply of coal. These efforts will contribute in saving coal, a depleting reserve and a primary resource for power generation and other metallurgical applications, thus helping to cater to future demand.

Technological Well-being: With the implementation of the project activity, the company upgrades its power generation process to a more energy efficient and cleaner process. The technical skills and knowledge of the company employees will also improve. Furthermore, the introduction and implementation of new technologies always paves the way for other industries to follow suit resulting in an overall betterment of the whole Industrial sector over a period of time. Furthermore, the technical measures have been a challenge in the initial stage for the DSIL team of engineers considering the great amount of risks associated with any such alterations in technology.

A.3. Project participants:

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Name of Party involved (*) ((Host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Ministry of Environment and Forest, Government of India (Host Country)	DCM Shriram Industries Ltd (Private)	No

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

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

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A.4.1.1. Host Party(ies):

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India

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

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Rajasthan state

A.4.1.3. City/Town/Community etc:

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Kota city in Kota district at Shriram Nagar

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

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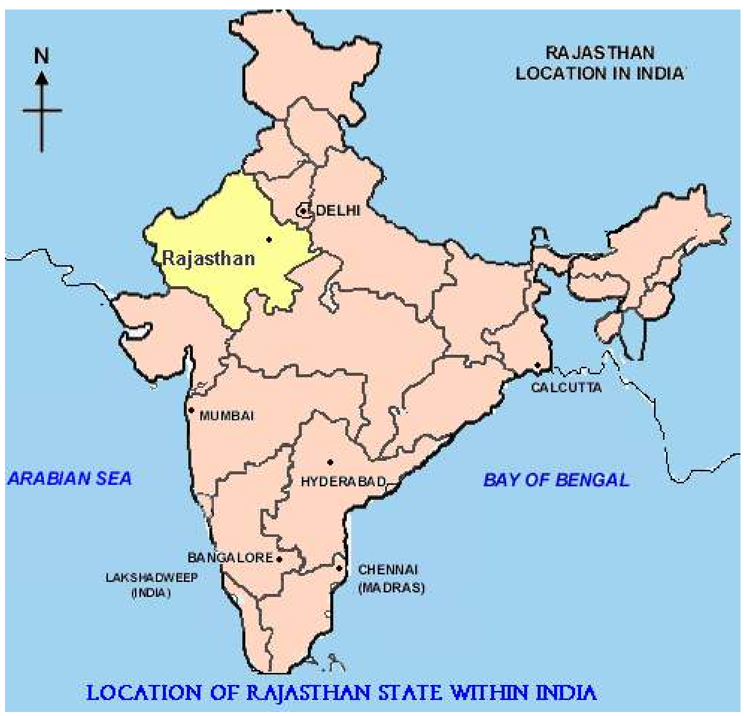
The project activity is implemented in the power generation system of the Shriram Rayons unit, located at Shriram Nagar, Kota district, Rajasthan. Kota district is bordered on the north and northwest by Sawai Madhopur, Tonk and Bundi districts. Kota district is well connected with neighboring districts and the major cities outside the state. The national highway no.12 (Jaipur - Jabalpur) passes through the district. The project site is at a distance of approximately 239 kms from Jaipur and 505 kms from Delhi

The Delhi-Mumbai railway line passes through the Kota junction. The district has 148.83 km of railway line on the Kota-Beena section, 98.72 km on the Nagda-Mathura (Mumbai-Delhi) section and 24.26 km on the Kota-Chittorgarh section. The nearest airport is at Jaipur (239 kms).



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

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Type II.B: **Supply side energy efficiency improvements – generation,** Version 09, EB 33

Type I.C: **Thermal energy for the user with or without electricity,** Version 12, EB 33

Technology involved:

In the pre-project scenario 3coal fired boilers (3x27 tonnes per hour) along with 4MW condensing cum extraction type Steam Turbo Generator (STG) set and one 2MW condensing type Steam Turbo Generator (STG) set were used to meet the process steam requirement as well as to generate power to the tune of 6MW. The remaining power demand was met through the power import from the Rajasthan State Electricity Board grid as and when required.

The project activity involves the installation of the backpressure type Steam Turbo Generator set of 3MW capacity to generate additional power without increasing the overall steam requirement. In keeping with their commitment towards environmental sustainability, the company has also proposed to improve the overall powerhouse efficiency by installing a 42Kg/cm^2 28TPH Fluidised Bed Combustion (FBC) boiler with multi-fuel firing capability within the powerhouse.

Such efficiency improvement of the cogeneration system has enabled the project proponent to reduce the specific coal consumption for steam and power generation. Direct reduction in specific coal consumption for cogeneration system contributes to lower CO2 emissions:

- at the plant end due to lower coal consumption through higher generation efficiency
- at the plant end due to usage of agro fuel (20% blending of biomass)

The technology being adopted to increase the efficiency of the boiler is environmentally safe and reduces environmental stress locally and globally. To ensure operational benefits and GHG reductions from the project activity, adequate preventive maintenance of the boiler is required.

Steam generation set-up:
In FBC boilers, coal is burnt on a bubbling air-bed thereby giving more retention time for the burning of coal. There is a reduction in unburnt carbon in bed ash in these boilers and low quality coal can also be burnt effectively. The FBC boiler of 28TPH capacity and a pressure of 42 kg/cm^2 are capable of burning rice husks, mustard husks and mustard stalks along with coal. This installation also comprises a demineralised water plant, fuel storage, fuel conveying system, ash handling system, etc.

Backpressure Steam Turbo Generator set:
In steam turbo generator sets, the total heat (or the Enthalpy) available in the steam is converted to electrical energy. The amount of power generated depends upon the quantity of enthalpy absorbed (the difference between the quantity of enthalpy in steam supplied to turbine and the quantity of enthalpy in steam coming out from the turbine) and is thus greater with higher steam inlet pressures than with lower steam inlet pressures. The 3MW backpressure STG set is allied with control panels for TG set control and equipment for synchronising with existing power sources.

High Boiler Efficiency: The installation of FBC boiler will improve the efficiency of steam generation system as compared to spreader stoker thereby reducing the coal consumption in the proposed boiler.

Higher power from backpressure turbine: By having higher pressure drop across the turbine, additional power can be generated with the same quantity of steam.

Part of the existing steam and power generation facility will be shut down to reduce coal consumption and agro-fuel will also replace coal for process steam and power generation.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

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The total emission reductions over the first crediting period (7 years) of the project are expected to be as under:

Years	Annual estimation of emission reductions in tonnes of CO2 e
2008	55,094
2009	55,094
2010	55,094
2011	55,094
2012	55,094
2013	55,094
2014	55,094
Total estimated reductions for the first crediting period	**385,656**

Total number of crediting years	21 (7 x 3)
Annual average over the crediting period of estimated reductions (tones of CO2 e)	55,094

In the above table, the year 2008 corresponds to the period starting from 01.04.2008 to 31.03.2009. Similar interpretation shall apply for remaining years. The crediting period will start from the date of registration of the project with CDM EB.

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

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No public funding from Annex 1 parties is available for this project.

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

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As per Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities - "A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point"

The project activity is not a debundled component of a large project activity as there is no small scale CDM project activity or an application registered by DSIL, in the same project category in the last two years within 1 km of the project boundary of the proposed small-scale project activity.

SECTION B. Application of a baseline and monitoring methodology

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

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Type: II – Energy efficiency improvement projects
Sub Type: AMS II.B.–Supply side energy efficiency improvements–generation, Version-09, EB 33

TYPE I – Renewable Energy Projects
Sub Type: AMS I.C. -Thermal energy for the user with or without electricity, Version-12, EB 33

Reference: Appendix B of the simplified modalities and procedures for small-scale CDM project activities - indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories.

B.2 Justification of the choice of the project category:

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As described in category TYPE II.B. "This category comprises technologies or measures to improve the efficiency of fossil fuel generating units that supply an electricity or thermal system by reducing energy or fuel consumption by up to the equivalent of 60 GWhe per year. Examples include efficiency improvements at power stations and district heating plants and co-generation. The technologies or measures may be applied to existing stations or be part of a new facility. A total saving of 60 GWhe is equivalent to maximal saving of 180 GWhth in the fuel input to the generation unit."

Category	Criteria	Project activity	Applicability
Type II.B. Supply side energy efficiency improvements – generation	Improvement in the efficiency of the fossil fuel generating units that supply an electricity or thermal system by reducing energy or fuel consumption	The energy efficiency improvements measures involved in the project activity: Reduction in coal and steam consumption in the steam generation set and power house (i.e., by installing the new 28TPH FBC multi-fuel boiler and 3MW back pressure turbine)	Methodology is applicable to activity
	The technologies or measures may be applied to existing stations or be part of a new facility	The Project involves installation of new 28TPH FBC multi-fuel boiler and 3MW back pressure turbine that constitutes a measures applied to existing station	Methodology is applicable to activity
	A total saving of 60 GWhe is equivalent to maximal saving of 180 GWhth in	The project consists of industrial energy efficiency improvement measures	Methodology is applicable to activity

	the fuel input to the generation unit.	through technological up gradation and reduction in fuel consumption. It reduces energy consumption on the supply side. Annual average reduction in the fuel input from the project activity is of the order of 123.6$GWh_{th.}$	

As described in category TYPE I.C. "This category comprises renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuels. Examples include solar thermal water heaters and dryers, solar cookers, energy derived from renewable biomass for water heating, space heating, or drying, and other technologies that provide thermal energy that displaces fossil fuel. Biomass-based co-generating systems that produce heat and electricity are included in this category."

Category	Criteria	Project activity	Applicability
Type Thermal energy for the user with or without electricity I.C	This category comprises renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuels.	The project activity is a fuel switch project in existing industrial applications, which comprises 20% of replacement of coal with biomass in steam and power generating system.	Methodology is applicable to activity
	Cogeneration projects that displace/ avoid fossil fuel consumption in the production of thermal energy (e.g. steam or process heat) and/or electricity shall use this methodology. The capacity of the project in this case shall be the thermal energy production capacity i.e. 45 MWth.	From 20% coal replacement with biomass in FBC boiler the total thermal generation from this boiler is less 5.44MWth which is less than 45MW.	Methodology is applicable to activity

Thus the baseline methodology prescribed by the UNFCCC in Appendix B to Simplified M&P for small scale CDM projects activities belonging to Category II.B. and I.C. are justifiably applicable for the project activity.

B.3. Description of the project boundary:

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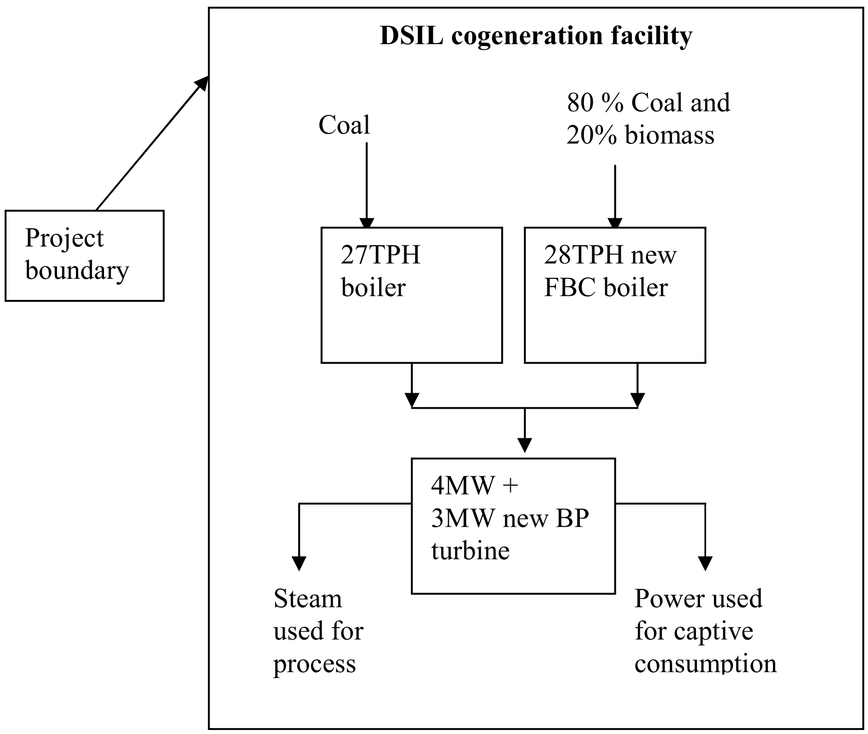
"The project boundary is the physical, geographical site of the fossil fuel fired power station unit affected by the efficiency measures and fuel switching measures." This project boundary includes the production facility, the boilers, the turbine, auxiliary equipments and machinery, and allied systems.

The project activity deals with the co-generation facility of DSIL where coal is consumed as fuel to generate steam and power. The power generated from the project activity meets the captive requirement of the plant. Therefore, the project boundary encompasses the co-generation facility of DSIL. The following diagram indicates the energy flows into the boundary and GHG emissions associated with fuel combustion within the project boundary.



B.4. Description of baseline and its development:

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As per the decision 17/CP.7 paragraph 43, a Clean Development Mechanism project activity qualifies as additional if the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.

The project activity brings energy efficiency improvements that reduce energy consumption in auxiliary equipment and the consumption of fossil fuels, and thus brings net CO_2 emission reductions.

Identification of alternative baseline scenarios consistent with current laws and regulations

In order to establish that the project activity is additional, DSIL identified plausible project options, which include all possible courses of actions that could be adopted in order to generate process steam for the plant. There were two plausible alternatives:

Option 1. The implementation of proposed project activity, but not undertaken as a CDM project activity

Option 2. The continuation of the current situation

Analysis of Option 1:
The project activity is a set of energy efficiency improvement and fuel switch measures undertaken in the boiler system and turbine system with net CO_2 emission reductions due to reduced coal consumption in the boiler system and steam consumption in the turbine system. In this alternative, DSIL may implement the project activity without considering CDM. This alternative is in compliance with all the applicable legal and regulatory requirements and may be a part of the baseline.

However this alternative had investment, technological and prevailing practice barriers associated to its implementation. Historically, there has never been a preference for implementation of the energy efficiency measure across the whole textile industry. Therefore, the project activity would not have been implemented due to the existence of the barriers discussed below without the incentives offered by CDM and is therefore not a part of the baseline.

Analysis of Option 2:
In this alternative, the energy efficiency and the fuel switch measures are not adopted, the DSIL power plant continues to function with the installed boiler and turbine system. However, the project promoter, with his commitment towards the environment sustainability and the possibility of generating carbon credits from the emissions reduction of the project activity, agreed to invest the additional amount required for the power project (after being 'educated' about the CDM process and related advantages).

In view of the above, it may be concluded that the additional revenue from the sale of CERs played a very important role in facilitating the project.

Estimation of Emission Reduction:
The project activity is a retrofit measure involving installation of new steam and power generating equipment replacing the earlier set of boilers and turbines. Therefore the energy baseline of the project activity will be the monitored performance of the cogeneration system in the pre-project scenario. The baseline emission will therefore have two components:

- coal consumption through higher generation efficiency (installation of new FBC boiler and new back pressure turbine)
- reduction in coal due to usage of agro fuel (20% blending of biomass in new FBC boiler)

Total reduction in coal consumption in project scenario is calculated and multiplied by coal emission factor giving the net emission reductions from the project.

B.5. 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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According to Appendix A to Annex B document of indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories, project participants shall provide qualitative explanation to show that the project activity would not have occurred anyways, atleast one of the listed elements should be identified in concrete terms to show that the activity is either beyond the regulatory and policy requirement or improves compliance to the requirement by removing barriers: The additionality of the project activity is shown according to Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

Additionality of the project as described in proposed baseline methodology is discussed further:

Investment barrier

The project activity is highly investment-intensive. In the context of decision making for this energy efficiency project activity at the co-generation facility, Internal Rate of Return (IRR) has been selected as the most suitable financial indicator for assessing the economic attractiveness of the project. The financial analysis shows that the project activity could not have been possible if CDM benefits were not taken into account.

Availability of the equity required for the project: The principal investment barrier is the availability of equity for the project. The investors had made it absolutely clear that the project has low returns and is not a preferred option. It was only upon the consideration of the additional revenue from the sale of CERs, the board considered the proposal after detailed discussion and resolved that the proposal for implementation of a proposed project has been approved. It has also been stated that since the project has a low return, but is needed for the long term, possibilities of availing carbon credit under CDM must be actively pursued. Furthermore, it has been resolved that Executive Committee of the company has been authorized to take necessary steps for arranging funds for the project and take all necessary action for implementing the project.

Bank finance: In view of the un-common practice of the project, banks were reluctant to extend financing to the project (necessary documents will be made available to the DOE at the time of validation).

It should be highlighted that the investors had initially agreed to invest the additional amount required for the power project (after being 'educated' about the CDM process and related advantages) only in the form of Cumulative Convertible Preference Shares and it was much later when project was being developed under the CDM that they agreed to bring in additional investments in the form of equity.

In view of the above, it may be concluded that the additional revenue from the sale of CERs played a very important role in facilitating the mobilization of the required equity for the project.

Operational barriers

Although most of the technology measures implemented under the CDM project activity are available elsewhere in other industrial sector, identification and characterization of operational features in rayon manufacturing that governs actual energy load is unique in the sector and is not commonly practiced in similar sectors of the host country. The reason is simple; the sector focus is on meeting market requirements rather than on energy conservation activities. The project concept is new to the project promoters.

DSIL has adopted a continuous process for production and runs 24 hours a day through out the year. Installation of the new boiler and turbine and then holding up with the electricity production as well as with the steam header without affecting the plant's operation was really troublesome. In order to catch up the plant, both the systems (steam and power) needed to be operated simultaneously which increased operational costs.

These operational barriers make the investment in the proposed project activity a very risky proposition, not only from the project activity's point of view but also from the operations point of view as any mishap could adversely affect the rayon manufacturing operations, leading to significant financial losses.

The technology failure would result in project investment losses, losses due to boiler replacement; STG set replacement, and the associated production losses. However, the project proponent adopted the technology and took the risk of implementing the project activity by overcoming all the operational barriers to reduce green house gas emissions.

A technologically less advanced option-alternative 2 to the project activity, wherein the boiler system was operated without adopting the energy efficiency measures of the proposed project activity. It involves no risks related to performance uncertainty, since the existing system is operating smoothly but would have led to higher GHG emissions. Further, the alternative 2 to the project activity is the prevailing practice in similar sectors and therefore does not face any barrier to its implementation.

Other barriers

Managerial resources barriers

DSIL is in the business of manufacturing rayon. Its employees have acquired expertise in production of rayon. They can also operate coal fired spreader stoker type boilers and extraction / condensing type steam turbo generators very well. However, DSIL do not have adequate expertise and exposure to the complications involved in operations and maintenance of the FBC boilers and Back Pressure type STG sets.

Therefore DSIL management would need to arrange for professional training programs in order to improve the employees' knowledge of the energy efficiency improvements. DSIL personnel had to put in consistent efforts towards developing their in-house capabilities in order to successfully implement the project activity. It must be pointed out that the specialized manpower required to operate the plant is not available locally and has to be recruited from other parts of the country.

In spite of all these barriers and the large financial risks, DSIL has decided to implement the CDM project activity and reduce the GHG emissions from generation of steam and power in its power house.

Prevailing practice

The project type is not a prevailing practice in the area of implementation. DSIL was one of the first thermal power generation utilities of its type in the rayon industry in the northern region, to identify the specific projects where the energy efficiency improvement in thermal power generation could be adopted and specific coal consumption and its associated emissions could be reduced. The measures adopted were a proactive step towards greenhouse gas emission reductions. DSIL is one of the pioneers in the region that continued to maintain low specific coal consumption for thermal power generation utilities.

All such similar industrial units in the region and in the country have been operating their existing boilers and power units without implementing innovative energy efficiency measures similar to the project activity.

The project featuring the installation of new FBC boiler with multi-fuel firing facility replaces the existing coal spreader stoker boiler.

It may be concluded that there are significant barriers (technical / investment / others) that have resulted in low penetration level of the technology in the area and the proposed project activity is NOT a common practice.

Impact of CDM registration

It has been established that the project activity would not have occurred in the absence of the CDM because no sufficient financial, policy, or other incentives exist locally to foster the implementation of such thermal energy efficiency projects in India. Without the proposed carbon financing for the project, DSIL would not have taken the investment risk to implement the project activity. The project activity is not a baseline scenario, and without the project activity, the DSIL power plant would continue to operate without any reductions in the coal consumption and associated greenhouse gas emissions.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The proposed CDM project activity will directly reduce steam consumption and coal consumption for electricity generation. With the installation of a multi-fuel fired FBC boiler there is a subsequent decrease in the consumption of coal, and in the related GHG emissions. Also, when using the new backpressure STG set, the steam requirements for power generation are lower, and thus the consumption of coal for steam generation is lower. The fuel switch in the FBC boiler and the increased efficiency of power generation with the backpressure STG set will reduce the overall consumption of coal in the DSIL unit.

In the absence of the project, the DSIL power house would, for one part, have continued to consume the amount of steam it currently uses, which is larger than the amount of steam used in the project activity for the same quantity of power produced, and for the other part, the DSIL unit would have continued using only coal as a fuel in its boiler. This would have led to GHG emissions from the excessive combustion of coal.

It is important to note that there is no mandatory requirement for the unit to adopt another fuel and use more efficient boilers and turbines as the previous STG set was operated without any major breakdown and /or safety hazard.

In terms of monitoring of the proposed CDM project, the proposed energy efficient interventions shall need to be monitored.

The identified project activity improves the efficiency of the plant as it brings down the specific steam consumption and hence it is reflected upon the reduction in coal consumption in the boiler and partial displacement of coal with biomass also reduces the coal consumption in the boiler. Thus the baseline has been established according to the existing specific steam consumption in absence of the energy efficient project activity and the baseline for biomass substitution is its equivalent usage of coal in the project activity.

Emission reductions:

(1) Baseline emissions from the reduction in coal reduction from the improvement of the efficiency of the plant as it brings down the specific steam consumption
(2) Baseline emission from 20% of coal substitution with biomass

Step (1)
Formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity:

$SSCR_{Project}$ = $S_{Project}$ / $P_{Project}$
$SSCR_{Project}$ = Specific Steam Consumption Rate for the project activity (MT/MW)
$S_{Project}$ = Steam generation in the project scenario (tonne p.a.)
$P_{Project}$ = Total Power output from the turbine in the project scenario (MW)

Formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category:

$SSCR_{Baseline}$ = $S_{Baseline}$ / $P_{Baseline}$
$SSCR_{Baseline}$ = Specific Steam Consumption Rate in the baseline scenario (MT/MW)
$S_{Baseline}$ = Steam generation in the baseline scenario (tonne p.a.)
$P_{Baseline}$ = Total Power output from the turbine in the baseline scenario (MW)

Reduction in steam consumption, S_{net} (tonne p.a.)

S_{net} = $SSCR_{diff}$ * P_{output}
$SSCR_{diff}$ = Difference in SSCR ($SSCR_{Baseline}$ - $SSCR_{Project}$) (MT/MWh)
P_{output} = Actual power output from the project activity in that year (MWh)

CO2 emission reduction from the energy efficient component per year

EE_y = (S_{net} * $COEF_{Coal}$) / ($CC_{project,y}$)

Where
Snet = Net reduction in steam consumption (tonne/annum)
$CC_{project,y}$ = Coal consumption ratio in project in year y, Mt of steam/tonne of coal
= ($S_{Project}$ / $Q_{Coal,,y}$) i.e., Steam generated / coal consumed in year)
$COEF_{Coal}$ = Carbon dioxide Emission Factor of Coal (Tonne of CO2e/Tonn of fuel)

Step (2)
Procedure for calculating baseline emissions from partial substitution of fossil fuel as per Paragraph 10 of AMS I.C. the procedure is:
For steam / heat produced using fossil fuels the baseline emissions are calculated as follows:

$BE_{Coal} = Q_{biomass,y} * NCV_{biomass} * COEF_{Coal} / Q_{Coal,,y}$

where:

BE_{Coal}	the baseline emissions from partial substitution of coal with biomass by the project activity during the year y in tCO2e
$Q_{Coal,,y}$	Quantity of coal used in project in year y, tonne/ y
$Q_{biomass,y}$	Quantity of biomass used in project in year y, tonne/ y
$NCV_{biomass}$	Net calorific value of biomass, kcal/kg

Therefore the total emission reductions from the project acitivity are: $BEy = EE_y + BE_{Coal}$

To be conservative side the baseline emissions due to natural decay or uncontrolled burning of anthropogenic sources of biomass and project emissions from the combustion of biomass are not considered. Therefore the emissions from the same for the project activity can be neglected in this project case.

The project emissions from the transportation of biomass arise, but all together the baseline emissions from the transportation of coal saved are not considered. Therefore the emissions from the transportation of the fuel for the project activity will be minimal and to be conservative can be neglected in this project case.

Leakage: The project is neither expecting the equipment transfer from another activity nor is the existing equipment transferred to another activity. Moreover, the availability biomass in the region is abundant, over and above that quantity which is utilized in the proposed project. Since the implementation of the project activity is neither transferring the equipment nor diverting the biomass from other users to the project plant there is no leakage estimated from the project.

B.6.2. Data and parameters that are available at validation:

(Copy this table for each data and parameter)

Data / Parameter:	Coal consumption in the baseline year
Data unit:	Tonnes per year
Description:	Total coal consumed in the baseline (2004,2005,2006)
Source of data used:	Plant records
Value applied:	-
Justification of the choice of data or description of measurement methods and procedures actually applied :	The coal consumed for the past years is considered as base for calculating the total coal required for the project activity and this value is considered as a standard value and need not be monitored parameter. However records of the coal consumption are maintained for complete crediting periods.
Any comment:	The data will be archived for 2 years after the completion of the crediting period.

Data / Parameter:	Power generation in the baseline year
Data unit:	Tonnes per annum
Description:	Total power output of the plant from the project acitivity
Source of data used:	Plant records
Value applied:	-

Justification of the choice of data or description of measurement methods and procedures actually applied :	The records on power generation capacity in the past years is considered as base for calculating the total coal saved in the project activity and this value is considered as a standard value and need not be monitored parameter. However records of the power production per month are maintained for complete crediting periods.
Any comment:	The data will be archived for 2 years after the completion of the crediting period.

Data / Parameter:	Steam generated in the baseline year
Data unit:	Tonnes per annum
Description:	Total steam generated for the baseline scenario
Source of data used:	Plant records
Value applied:	-
Justification of the choice of data or description of measurement methods and procedures actually applied :	The records on steam consumption in the past years is considered as base for calculating the total coal saved in the project activity and this value is considered as a standard value and need not be monitored parameter. However records of the steam generated per month are maintained for complete crediting periods.
Any comment:	The data will be archived for 2 years after the completion of the crediting period.

B.6.3 Ex-ante calculation of emission reductions:

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Emission reductions:

(1) Baseline emissions from the reduction in coal reduction from the improvement of the efficiency of the plant as it brings down the specific steam consumption
(2) Baseline emission from 20% of coal substitution with biomass

Step (1)

$SSCR_{Project}$ = $S_{Project}$ / $P_{Project}$
$SSCR_{Project}$ = Specific Steam Consumption Rate for the project activity (MT/MW)
$S_{Project}$ = Steam generation in the project scenario (tonne p.a.)
$P_{Project}$ = Total Power output from the turbine in the project scenario (MW)

$SSCR_{Project}$ = 55 / 7 = 7.857 MT/MW

$SSCR_{Baseline}$ = $S_{Baseline}$ / $P_{Baseline}$
$SSCR_{Baseline}$ = Specific Steam Consumption Rate in the baseline scenario (MT/MW)
$S_{Baseline}$ = Steam generation in the baseline scenario (tonne p.a.)
$P_{Baseline}$ = Total Power output from the turbine in the baseline scenario (MW)

$SSCR_{Baseline}$ = 60.5 / 6 = 10.083 MT/MW

Reduction in steam consumption, S_{net} (tonne p.a.)

S_{net} = (10.083 – 7.857) * 7 * 24 * 335
= 125,290 Mt of steam reduction / yr

CO2 emission reduction from the energy efficient component per year

EE_y = (125,290 * 1.713) / (5.1)
= 42,095 tCO2e/yr

Step (2)

$BE_{Coal} = Q_{biomass,y} * NCV_{biomass} * COEF_{Coal} / Q_{Coal,,y}$
= 7, 586 * 1.713
= 12,998 tCO2e/yr

Emission reduction from partial substitution of fossil fuel with biomass = 12,998 tCO2e/yr

Therefore the total emission reductions from the project activity are:
BEy = 42,095 + 12,998 = 55,094 tCO2e/yr

B.6.4 Summary of the ex-ante estimation of emission reductions:

>>

Emission reductions from energy efficiency measures (installation of new TG and Boiler Setup)

Year	Emissions Reductions of the project activity (tCO2e/yr)
2008	42,095
2009	42,095
2010	42,095
2011	42,095
2012	42,095
2013	42,095
2014	42,095

Emission reductions from 20% blending of biomass in boiler

Year	Emissions Reductions of the project activity (tCO2e/yr)
2008	12,998
2009	12,998
2010	12,998
2011	12,998
2012	12,998

2013	12,998
2014	12,998

Total emission reductions from the project activity are summarised as

Years	**Annual estimation of emission reductions in tonnes of CO2 e**
2008	55,094
2009	55,094
2010	55,094
2011	55,094
2012	55,094
2013	55,094
2014	55,094

In the above table, the year 2008 corresponds to the period starting from 01.04.2008 to 31.03.2009. Similar interpretation shall apply for remaining years. The crediting period will start from the date of registration of the project with CDM EB.

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	**Q(biomass)**
Data unit:	TPD
Description:	Quantity of biomass fired in FBC boiler
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	20% of coal fired in FBC boiler
Description of measurement methods and procedures to be applied:	100% data will be measured continuously in plant premises, and the recorded data will be archived in Electronic / Paper. The data will be cross verified with purchase records. The data is used to estimate the amount of emission reductions from the project activity.
QA/QC procedures to be applied:	The amount of biomass consumed in the project activity will be measured and will be archived in the paper and recorded in the logbooks. This data item will be recorded at the project sites which are under the control of project proponent. The biomass consumed is measured using calibrated weighing bridges and recorded by project proponent. Records of measurements will be used for calculating emission reductions.

Any comment:	The data will be archived for 2 years + crediting period.

Data / Parameter:	**Q(Coal)**
Data unit:	TPD
Description:	Quantity of Coal fired in FBC boiler
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	100% data will be measured continuously in plant premises, and the recorded data will be archived in Electronic / Paper. The data will be cross verified with purchase records. The data is used to estimate the amount of emission reductions from the project activity.
QA/QC procedures to be applied:	The amount of coal consumed in the project activity will be measured and will be archived in the paper and recorded in the logbooks. This data item will be recorded at the project sites which are under the control of project proponent. Records of measurements will be used for calculating emission reductions.
Any comment:	The data will be archived for 2 years + crediting period.

Data / Parameter:	**NCV(Coal)**
Data unit:	BTU/lb
Description:	Net calorific value of coal fired in FBC boiler
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	7800
Description of measurement methods and procedures to be applied:	100% data will be measured continuously in plant premises, and the recorded data will be archived in Electronic / Paper. The data is used to estimate the amount of emission reductions from the project activity.
QA/QC procedures to be applied:	NCV of coal is calculated once in every year. The data is monitored and is recorded for the proper monitoring procedures.
Any comment:	The data will be archived for 2 years + crediting period.

Data / Parameter:	**TP**
Data unit:	MWh
Description:	Total power generation
Source of data to be used:	Plant records
Value of data applied for the purpose of	The data holds a significant purpose for determining the total power generated..

calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Electricity meter is installed at the turbine outlet and recorded on continuous basis at the DCS and recorded in the logbooks on a continuous basis. The data will be archived either electronically or in papers and will be available upto two years after the crediting period. The project activity has employed state-of-the-art monitoring and control equipments that will measure, record, report and control the total electricity generated from the project activity. The monitoring and controls is part of the Distributed Control System (DCS) of the entire plant. All instruments are calibrated and marked at regular interval to ensure accuracy.
QA/QC procedures to be applied:	QA/QC procedures have been planned. The level of uncertainty level of data is low. This data would be used for calculating power contributed from new TG and boiler setup.
Any comment:	Meters at plant will automatically measure the data. The data will be recorded in project logbooks.

Data / Parameter:	**AP**
Data unit:	MWh
Description:	Auxiliary power consumption
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The data holds a significant purpose for determining the auxiliary power generated.
Description of measurement methods and procedures to be applied:	This will be measured from the data recorded in the logbooks on a continuous basis. The data will be archived either electronically or in papers and will be available upto two years after the crediting period.
QA/QC procedures to be applied:	QA/QC procedures have been planned. The level of uncertainty level of data is low. This data would be used for calculating power contributed from new TG and boiler setup.
Any comment:	Meters at plant will automatically measure the data. The data will be recorded in project logbooks.

Data / Parameter:	**CP**
Data unit:	MWh
Description:	Captive power consumption
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The data holds a significant purpose for determining the captive power consumption.

Description of measurement methods and procedures to be applied:	This will be measured from the data recorded in the logbooks on a continuous basis. The data will be archived either electronically or in papers and will be available upto two years after the crediting period. The project activity has employed state-of-the-art monitoring and control equipments that will measure, record, report and control the net electricity generated from the project activity. The monitoring and controls is part of the Distributed Control System (DCS) of the entire plant. All instruments are calibrated and marked at regular interval to ensure accuracy.
QA/QC procedures to be applied:	QA/QC procedures have been planned. The level of uncertainty level of data is low. This data would be used for calculating net power contributed from new TG and boiler setup for captive purposes.
Any comment:	Meters at plant will automatically measure the data. The data will be recorded in project logbooks.

Data / Parameter:	Production capacity of the plant in the project activity year
Data unit:	Tonnes per annum
Description:	Total production output of the plant in the project activity case
Source of data used:	Plant records
Value applied:	-
Justification of the choice of data or description of measurement methods and procedures actually applied :	The records on production capacity during the project year is considered for calculating the total coal saved from the project activity and this value will be recorded continuously on monthly basis.
Any comment:	The data will be archived for 2 years after the completion of the crediting period.

Data / Parameter:	Steam consumption in the project activity year
Data unit:	Tonnes per annum
Description:	Total steam generated for the baseline scenario
Source of data used:	Plant records
Value applied:	-
Justification of the choice of data or description of measurement methods and procedures actually applied :	The records on steam generation during the project year is considered for calculating the total coal saved from the project activity and this value will be monitored and recorded continuously on monthly basis.
Any comment:	The data will be archived for 2 years after the completion of the crediting period.

B.7.2 Description of the monitoring plan:

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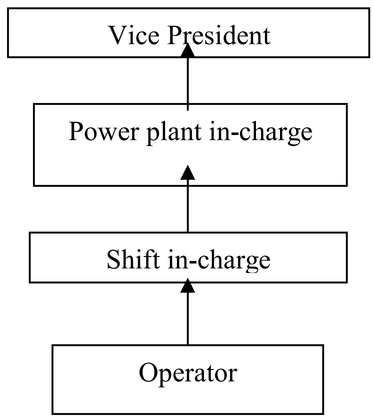
The management of the plant will designate one person to be responsible for the collection of data required to conduct the monitoring plan who will report to the Vice President (VP). The management of the plant will put in place monthly reporting of monitoring parameters. This data will be part of the management information systems for the power plant. The VP will also report consumption of fossil fuel that has been used in the plant. The emission reductions will be calculated monthly, reported back to the management of the plant and incorporated into existing management information systems.

The management structure follows as below



For the project activity at DSIL the following shall be measured:

- The energy content of the coal used in the boiler (i.e. generating unit) shall be calculated by measuring the NCV of coal fired and the quantity of coal fired in the boiler both before and after the project's implementation.
- The enthalpy of steam produced as well as the pressure and temperature of the steam produced, and the quantity of steam generated from the boiler is calculated both before and after the project's implementation.
- As the energy efficiency measures are being implemented in a step by step manner, the efficiency achieved with each measure might not be directly reflected in the energy efficiency calculations. Hence, the energy savings due to each measure at the time of its implementation shall also be measured.
- The enthalpy of feed water will be calculated from the temperature and pressure of the water.

Energy efficiency measurements for the boiler system shall be carried out all through the project activity's lifetime. Since coal is the principal fuel used in the boiler systems, the NCV and carbon content of samples of coal being fed to each boiler shall be studied at intervals set by DSIL.

The thermal energy used and generated in the baseline scenario and in the project scenario shall be monitored. The monitoring will consist of measurements to verify the amount of energy saved with each of the measures taken.

The appropriate equipment for measurement of all the necessary parameters is available at the site.

The QA and QC for the measured parameters shall be determined by the following:

- the recording frequency
- the measuring instruments used
- the calibration of the measuring instruments
- the parameters' reporting and record keeping tools mentioned in the monitoring tables

All the parameters mentioned above, will be monitored and records will be kept as per the procedure. The calibration of instruments pertaining to each of them will also be carried out as specified by the ISO 9000, either internally or by external agencies.

To calculate the technical losses after the implementation of each of the measures mentioned in the project activity, appropriate measuring instruments like thermometers, ammeters, flow meters etc. will be used. Since these equipments are not critical to the process, some of them are not covered by the ISO 9000 procedures, but an internal procedure is available for the checking of these instruments.

For these equipments, the data recording will be done by the group at a frequency of once a month. For the quality check and the reliability of the measuring instruments and equipments, a master list of instruments/ equipments, a calibration schedule for the instruments and test and calibration reports shall be available in the format prepared for DSIL.

The readings related to the boiler's operation shall be taken by the boiler house in-charge and maintained in the log sheets, or an electronic system will continuously record them.

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

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Date of determination of the baseline: 10/08/2007

Developed by (also a project participant): DCM Shriram Industries Limited

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
01/12/2005

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

>>
25y-0m

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

C.2.1. Renewable crediting period

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

>>
01/04/2008

C.2.1.2. Length of the first crediting period:

>>
7y-0m

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
NA

C.2.2.2. Length:

>>
NA

SECTION D. Environmental impacts

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

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The project activity does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India. The energy efficiency measures would reduce the plant's energy consumption for thermal power generation. It will directly reduce the facility's consumption of coal. The blending of agro fuels, upto 20% of coal used in the boiler, will also directly reduce the facility's consumption of coal.

The reduction in coal consumption leads to a reduction in the emission of carbon dioxide and Suspended Particulate Matter (SPM) from the combustion of coal and in GHG emissions from activities associated with coal transportation and mining. These efforts will allow saving of coal, a depleting reserve that is a primary resource for power generation and other metallurgical applications thus helping to cater to future demand. The reduction in the generation of power from thermal sources also helps in related pollution abatement. The project proponent has considered the environmental implications of the project activity. The environment and safety aspects of the project activity are discussed as follows:

Air Pollution:
As the project activity results in reduced use of coal, it has an inherent environmental benefit as regards air pollution. Reduced coal consumption for power generation will result in lesser emissions related to the combustion of coal. Apart from reduced GHG (CO_2) emissions, the project results in reduced SPM, SO_X and NO_X load on the environment.

Noise Pollution:
The project activity will not cause additional noise pollution. However, the plant will continue to maintain its practice of preventive maintenance for rotary equipments, steam lines, compressed air lines, high pressure equipments, which will automatically address the noise pollution from each source. Padding will be provided at locations prone to vibrating and rattling, noise proof cabins for operators will be provided where remote control is possible, and earmuffs will be provided to workers in highly noisy areas.

Wastewater:
The project activity will not cause any additional water pollution.

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

>>

The project activity has only positive environmental impacts when compared to the baseline scenario. The reduction in consumption of coal brings down the emissions associated with combustion of coal, which include carbon dioxide, sulphur oxides, nitrogen oxides, suspended particulate matter and respiratory suspended particulate matter. It will also reduce the adverse air pollution impacts related to the transportation of coal and coal mining activities that would have been required to meet the coal requirement of the boiler. The project activity also results in annual electrical savings. The project activity thus benefits the environment at a regional and global level.

The eventual negative environmental impacts from the implementation of the project activity have been identified and addressed. Indeed, the characteristics of the plant's effluents will be monitored and maintained so as to meet the requirements of the State Pollution Control Board and the minimum national standards for effluents. Air quality monitoring will also be undertaken to ensure that the dust pollution level is within the prescribed statutory limits. Noise monitoring will also be conducted regularly to keep a check on the noise levels in the high-noise work zones. The project proponent will maintain all records of such environmental monitoring properly.

SECTION E. Stakeholders' comments

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

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The project activity involves a set of modifications in the boiler and turbine systems, it has no significant negative environmental impacts on air, noise and water pollution outside the facilities. Therefore, comments on local pollution are not necessary.

The project has been implemented in the existing plant of Shriram Industries at Kota. The major stakeholders are:

- Village Panchayat
- Rajasthan Pollution Control Board
- Boiler Inspectorate
- State Renewable Energy Department
- Employees of the company

The stakeholders' consultation process is done in a participatory manner to assess the views and needs of the stakeholders concerning the project activity. DSIL is a proactive entity on the stakeholders' front; the company uses both formal and informal ways to reassemble stakeholders' opinions on activities that might affect them. The project activity, in its operation, will try to comply at best, and when it is relevant, to the requirements of the stakeholders.

E.2. Summary of the comments received:

>>

The project has obtained necessary clearances from relevant Government departments. The process of the stakeholders' consultation is on-going and the comments received will be summarized.

An important stakeholder and beneficiary of the project activity are the employees of DSIL. The project activity has excellent local environmental impacts and DSIL employees benefit from improved environmental surroundings. They appreciate DSIL management's contribution towards energy conservation and the reduction of greenhouse gases emissions, thereby contributing to mitigate global warming.

As mentioned above the Rajasthan State Pollution Control Board and the Environment Department of Government of Rajasthan do not require DSIL to submit an Environmental Impact Assessment for the project activity. However, DSIL is required to send a communication to the pollution control authorities whenever there is a major modification in its facilities. No comments have been received from them on the project.

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

>>

No comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Shriram Rayons (a unit of DCM Shiram Industries Limited)
Street/P.O.Box:	26A, Barakhamba Road
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City:	New Delhi
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E-Mail:	prashant@dcmsr.com
URL:	www.dcmsr.com
Represented by:	
Title:	Manager
Salutation:	Mr
Last Name:	Kapoor
Middle Name:	
First Name:	Prashant
Department:	Projects
Mobile:	
Direct FAX:	
Direct tel:	91 11 23313597
Personal E-Mail:	prashant@dcmsr.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in the project activity

Annex 3

BASELINE INFORMATION

The emission reductions from the total amount of coal consumed in the boiler are given in section B.6.1

To be conservative side the baseline emissions due to natural decay or uncontrolled burning of anthropogenic sources of biomass and project emissions from the combustion of biomass are not considered. Therefore the emissions from the same for the project activity can be neglected in this project case.

The transportation of coal and biomass to the project site results in emissions of CO_2 to the air. However, as the project activity significantly reduces the coal uptake, it results in corresponding decrease in such emission from transportation. To render simplicity to these calculations, it has been assumed that the emissions resulting from transportation of biomass will off-set those that have been prevented by reduction in transportation of coal.

Therefore Emission Reductions = Baseline Emissions – Project Emissions – Leakage

Annex 4

MONITORING INFORMATION

The selected monitoring methodology covers the following measures:

- Energy savings shall be measured after the implementation of the efficiency measures, by calculating the energy content of the fuel used by the generating unit and the energy content of the electricity or steam produced by the unit. Thus both fuel use and output need to be metered.
- A standard emission coefficient for the fuel used by the generating unit is also needed. IPCC default values for emission coefficients may be used.
- In the case of coal, the emission coefficient shall be based on test results of samples of the coal purchased if such tests are part of the normal practice of coal purchases.

For the project activity at DSIL the following shall be measured:

- The energy content of the coal used in the boiler (i.e. generating unit) shall be calculated by measuring the NCV of coal fired and the quantity of coal fired in the boiler both before and after the project's implementation.
- The enthalpy of steam produced as well as the pressure and temperature of the steam produced, and the quantity of steam generated from the boiler is calculated both before and after the project's implementation.
- As the energy efficiency measures are being implemented in a step by step manner, the efficiency achieved with each measure might not be directly reflected in the energy efficiency calculations. Hence, the energy savings due to each measure at the time of its implementation shall also be measured.
- The enthalpy of feed water will be calculated from the temperature and pressure of the water.

Energy efficiency measurements for the boiler system shall be carried out all through the project activity's lifetime. Since coal is the principal fuel used in the boiler systems, the NCV and carbon content of samples of coal being fed to each boiler shall be studied at intervals set by DSIL.

The thermal energy used and generated in the baseline scenario and in the project scenario shall be monitored. The monitoring will consist of measurements to verify the amount of energy saved with each of the measures taken.

The appropriate equipment for measurement of all the necessary parameters is available at the site.

The QA and QC for the measured parameters shall be determined by the following:

- the recording frequency
- the measuring instruments used
- the calibration of the measuring instruments
- the parameters' reporting and record keeping tools mentioned in the monitoring tables

All the parameters mentioned in section B, will be monitored and records will be kept as per the procedure. The calibration of instruments pertaining to each of them will also be carried out as specified by the ISO 9000, either internally or by external agencies.

To calculate the technical losses after the implementation of each of the measures mentioned in the project activity, appropriate measuring instruments like thermometers, ammeters, flow meters etc. will be used. Since these equipments are not critical to the process, some of them are not covered by the ISO 9000 procedures, but an internal procedure is available for the checking of these instruments.

For these equipments, the data recording will be done by the group at a frequency of once a month. For the quality check and the reliability of the measuring instruments and equipments, a master list of instruments/ equipments, a calibration schedule for the instruments and test and calibration reports shall be available in the format prepared for DSIL.

The readings related to the boiler's operation shall be taken by the boiler house in-charge and maintained in the log sheets, or an electronic system will continuously record them.

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