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:

Energy efficiency project at SOTL, Aurangabad
Version – 1
Date of completion – 25/01/2007

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

The main purpose of the project is to carryout energy efficiency measures, at all possible consumption points in the optical fibre manufacturing process unit at Sterlite Optical Technologies Limited (hereafter SOTL or project participant), Aurangabad, Maharashtra, so as to reduce electrical energy consumption. Reduced consumption of energy will lead to displacing equivalent amount of grid energy, thus, reducing the consumption of fossil fuel. Hence, reducing the GHG emissions due to the burning of fossil fuel.

Sterlite is India's single integrated optical fibre manufacturer, and is among the selected few global manufacturers. SOTL was formed by the de-merger of the erstwhile telecom division of Sterlite Industries (India) Limited with effect from 1st July 2000 to enable a sharper focus on each of the businesses. SOTL range of telecom cables had been manufactured under Sterlite Industries (India) Limited from 1988 till year 2000 and under Sterlite Optical Technologies Ltd. from year 2000 onwards. SOTL enjoys a strong, globally competitive position in optical fiber and cables, which stems from technological advancements in its fiber production process. In India, SOTL is the market leader with a share of over 60% in optical fiber and telecom cable products. SOTL currently exports over 35% of total sales volumes in optical fiber products. In FY 2005-06, SOTL telecom products were exported to over 30 countries across the globe.

SOTL, Aurangabad has two electrical energy sources namely state grid and heavy furnace oil (HFO) fired captive power plant (CPP). The proposed project will result in the saving of around 47 GWh of electricity utilization annually.

All the energy conservation activities undertaken by SOTL have resulted in considerable energy savings .

Contribution of Project Activity to Sustainable Development:

Indian economy is highly dependent on “fossils” as fuel to generate energy and for production processes. Conventional power plants are the major consumers of fossil fuels in India and yet the basic electricity needs of a large section of population are not being met.

This results in excessive demands for electricity and places immense stress on the environment. Changing fossil fuel consumption patterns will require a multi-pronged strategy focusing on demand, reducing wastage of energy and the optimum use of Renewable Energy (RE) sources.

Government of India has stipulated following indicators for sustainable development in the interim approval guidelines[1] for CDM projects.

1. Social well-being
2. Economic well-being
3. Environmental well-being
4. Technological well-being

1. Social well being:

- The plant site is in sub-urban area where poverty and other economic backwardness are prevailing. The project would lead to the development of the region.
- During project implementation, employment for local people around the plant site was generated.
- Other than these, there are various kinds of mechanical work, which generated /will generate employment opportunity on regular and permanent basis.

2. Economic well being:

- The project activity generates employment in the local area.
- Energy savings, in terms of energy units and costs, benefits the industry
- The project creates a business opportunity for local stakeholders such as bankers, consultants, suppliers, manufacturers, contractors etc.
- The above benefits due to project activity ensure that the project would contribute to the social and economic well being in the region.
- Hence, the project contributes to the economic sustainability, which is promotion of decentralization of economic power.

3. Environmental well being:

- Energy efficiency project reduces energy consumption, generated by using fossil fuels. Project also reduces pollution in general. All the necessary measures have been taken in the plant's design for minimizing the impact on the ecology of the environment.

4. Technological well being:

- The technology selected for the project is a more energy efficient and innovative.
- This ensures an optimum usage of fuel thereby leading to resource sustainability.

In view of the above, the project participant considers that the project activity profoundly contributes to the sustainable development in the region of the project activity.

A.3 Project participants:

Name of the Party involved ((host) indicates a	Private and/or Public entity (ies) Project participants (as applicable)	Kindly indicate if the party involved wishes to be considered as project

[1] Ministry of Environment and Forest, web site: http://envfor.nic.in:80/divisions/ccd/cdm_iac.html

host party)		participant (Yes/No)
India	• Sterlite Optical Technologies Limited (SOTL)	▪ No

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

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

A.4.1.1. Host Party(ies):

India

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

Maharashtra

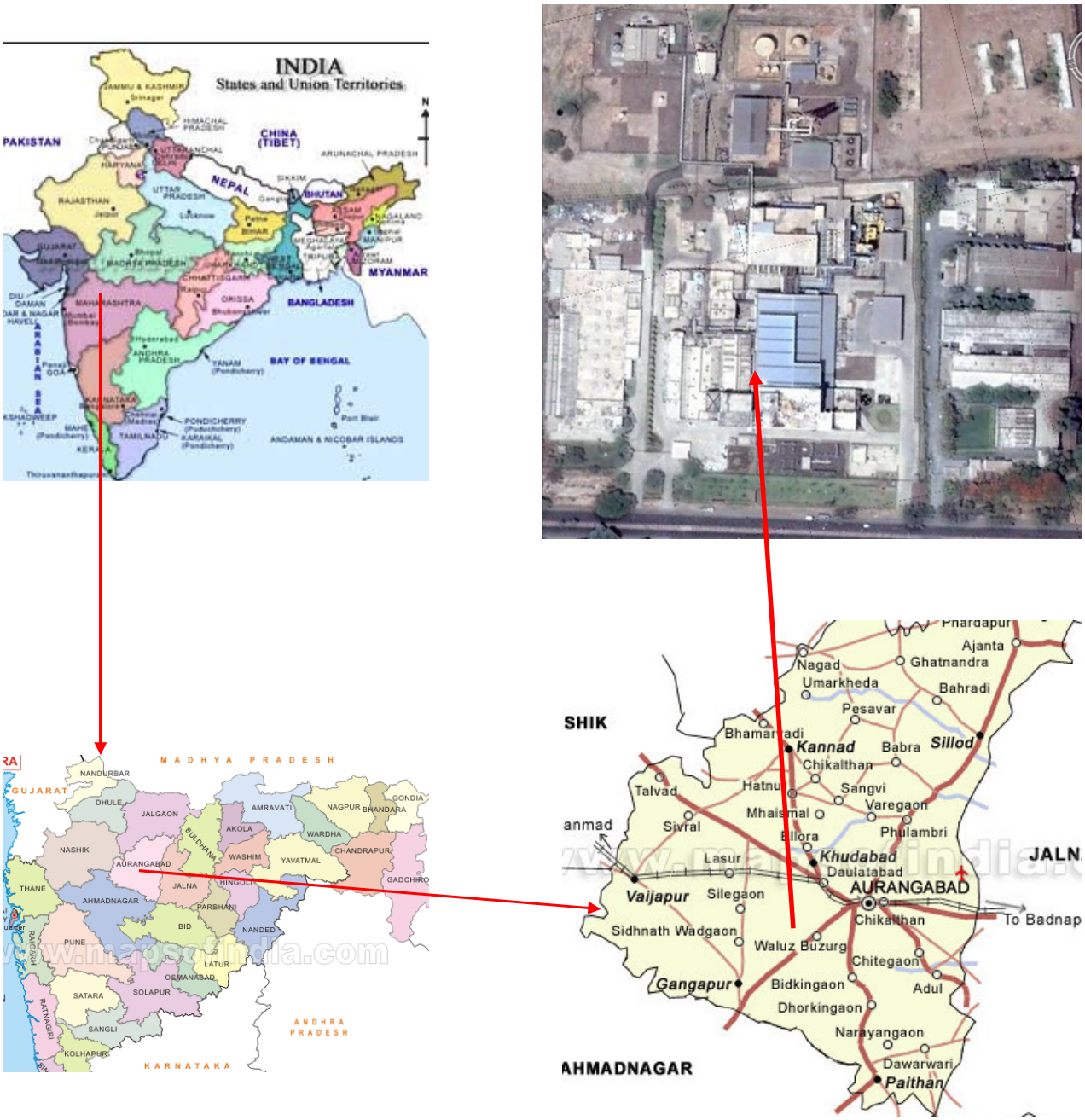
A.4.1.3. City/Town/Community etc:

Maharashtra Industrial Development Corporation (MIDC), Waluj
District – Aurangabad

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

- Project Site : MIDC, Waluj
- District : Aurangabad
- State : Maharashtra
- Lattitude : 19° 50' 25"N
- Longitude : 75° 13' 43"E

Figure 01: Site Location



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

As defined under Appendix B of the simplified modalities and procedures for small-scale CDM project activities, the project activity proposes to apply following project types and categories:

- Type :II –Energy Efficiency Improvement Projects
- Project Category :Energy efficiency and fuel switch measures for industrial facility (II.D) (Version 09)

- **Requirements with respect to technology/measure under energy efficiency and fuel switch measures for industrial facility (II.D) (Version 09)**

This category comprises any energy efficiency and fuel switching measure implemented at a single industrial or mining and mineral production facility. This category covers project activities aimed primarily at energy efficiency; a project activity that involves primarily fuel switching falls into category III.B.1 Examples include energy efficiency measures (such as efficient motors), fuel switching measures (such as switching from steam or compressed air to electricity) and efficiency measures for specific industrial or mining and mineral production processes (such as steel furnaces, paper drying, tobacco curing, etc.). The measures may replace, modify or retrofit existing facilities or be installed in a new facility. The aggregate energy savings of a single project may not exceed the equivalent of 60 GWh_e per year. A total saving of 60 GWh_e per year is equivalent to a maximal saving of 180 GWh_{th} per year in fuel input.

Captioned energy efficiency project consists of number of energy efficiency initiatives. These initiatives include process change, efficiency measures and introduction of new technology. They are as follows-:

1. Process switch from Modified Chemical Vapour Deposition (MCVD) process to CORE process.
2. Process switch from Sleeving Process to Over Cladding Deposition (OVD).
3. Waste heat recovery from CPP for generation of chilled water by installing Vapour Absorption Machine (VAM)
4. Other energy efficiency schemes

In the manufacturing of optical fiber there are two processes namely MCVD + Sleeving and the second process is CORE + OVD.

In the former process, a special glass tube is deposited on the inside with “soot” formed from the heating of $SiCl_4$ (along with dopants) by a hydrogen-oxygen flame. When the deposition is complete, this rod is placed in another special glass tube which is then heated and this outer glass tube is fused onto the inner rod. This process is the MCVD + Sleeving process.

In the second process, i.e. in the CORE + OVD process, the silicon tetrachloride along with the required dopants is deposited on the outside of a rotating alumina rod called the Mandrel. As the silicon tetrachloride (and dopants) are directly heated by a hydrogen-oxygen flame, this process is more energy efficient than the MCVD process where the heating is done from outside the glass

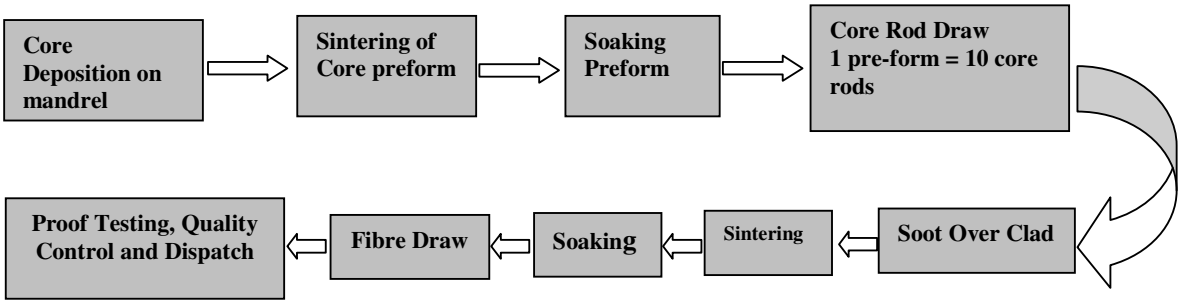
tube. However, in this process it has to be ensured that there is no deposition of any undesirable particles on the core. This is done by providing cleaner ambient conditions than are required for the MCVD process where the deposition is from the inside.

In the OVD process, there is no limit on the amount of soot which is deposited on the core rod as the deposition is from outside. (Soot refers to the deposition of pure silicon dioxide, which is caused due to the oxidation of silicon tetrachloride in hydrogen-oxygen flame). In the earlier process, the diameter of the fused silica tube was the limiting factor for soot deposition within the tube. The pre-form thus formed in the OVD process is sintered to give the glass its transparent properties. This pre-form is equivalent to 10 rods formed in the MCVD process.

The rods formed after sintering are then taken for Soot Over Cladding (SOC or OVD) process, also called deposition process. Here, again the core rod is held in a lathe and the soot is deposited on the outside using the required mixture of silicon tetrachloride and a hydrogen-oxygen flame. As there is direct contact between the flame and the materials to be deposited, the energy in the form of hydrogen required in this process is lower. Since there is no collapsing of the external tube as in the case of the sleeving process, the pre-form can again be made as large as required. Here too, as the deposition is from the outside, the ambient conditions must be maintained at a cleaner level than in the sleeving process to prevent deposition of any undesirable particles on the over-deposit. This pre-form of core and over-deposit is again taken for sintering and the sintered pre-form is taken for drawing into the optical fiber.

In preform drawing process, fiber is drawn with a speed of 900 mpm (meter per minute). In this process, the sintered perform is heated in an induction furnace to melt the glass rod to wire, then this wire is coated with coating which is cured with UV lamps. The process of drawing has been improved in its drawing speed from 900 mpm to 1500 mpm which gives more output from the same energy input. This reduces unit energy consumption per fkm of fiber.

Figure 02, Energy Efficient Process Flow Chart



Waste Heat Recovery Boiler (WHRB) was installed at the Captive Power Plant (CPP) which consisted of a fossil fuel fired generator set. The waste heat is used to produce steam which operates the Vapor Absorption Machines (VAMs) which produce chilled water required for maintaining the ambient conditions of the process plant. The WHBR and VAMs replaced the earlier conventional centrifugal/reciprocating chilling machines that used electricity for producing chilled water.

All considered energy efficiency measures in the proposed project activity directly reduced the consumption for electricity from the grid, so itself reduce GHGs . Over and above, the project proponent has ensured that all emission parameters are well below the applicable standards.

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

Years	Annual estimation of emission reductions in tonnes of CO_2
2007 – 08 (Sept. onwards)[2]	41716
2008 – 09	41716
2009 – 10	41716
2010 – 11	41716
2011 – 12	41716
2012 – 13	41716
2013 – 14	41716
2014 – 15	41716
2015 – 16	41716
2016 – 17	41716
Total estimated reductions (tonnes of CO2 e)	**417160**
Total number of crediting years	**10**
Annual average of the estimated reductions over the crediting period (tCO2 e)	**41716**

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

No public funding is involved in the proposed project activity.

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

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

- A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

✓ With the same project participants;
✓ In the same project category and technology/measure; and
✓ Registered within the previous 2 years; and

[2] It is expected that project will be registered with CDM EB by Sept., 2007. Hence, start date is taken as Sept. 15, 2007. It will be actual registration date.

- ✓ Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

- ▪ If a proposed small-scale project activity is deemed to be a de-bundled component in accordance with paragraph 2 above, but total size of such an activity combined with the previous registered small-scale CDM project activity does not exceed the limits for small-scale CDM project activities as set in paragraph 6 (c) of the decision 17/CP.7, the project activity can qualify to use simplified modalities and procedures for small-scale CDM project activities.

  On the basis of the above, the project activity cannot be considered as de-bundled component of a large project activity as it is first small-scale project activity for SOTL, Aurangabad.

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:

Title: Energy Efficiency Improvement Projects **-** II.D. – Energy efficiency and fuel switch measures for industrial facility (Version 09)

Reference: Appendix B of the simplified M & P for small-scale CDM project activities - indicative simplified baseline and monitoring methodology for selected small scale CDM project activity categories (Version – 07:28 November 2005).

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

"Appendix B of the simplified modalities and procedures for small-scale CDM project activities", provides indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity category. As per this document, the proposed CDM project falls under II.D. Energy efficiency and fuel switch measures for industrial facility (Version 09)

Baseline methodology for projects under Type II.D has been detailed in paragraphs 3 to 5 (Type II.D) of the above-mentioned document. Paragraph 5 (Type II.D) applies to this project activity.

According to paragraph 5 of II. D the baseline is -

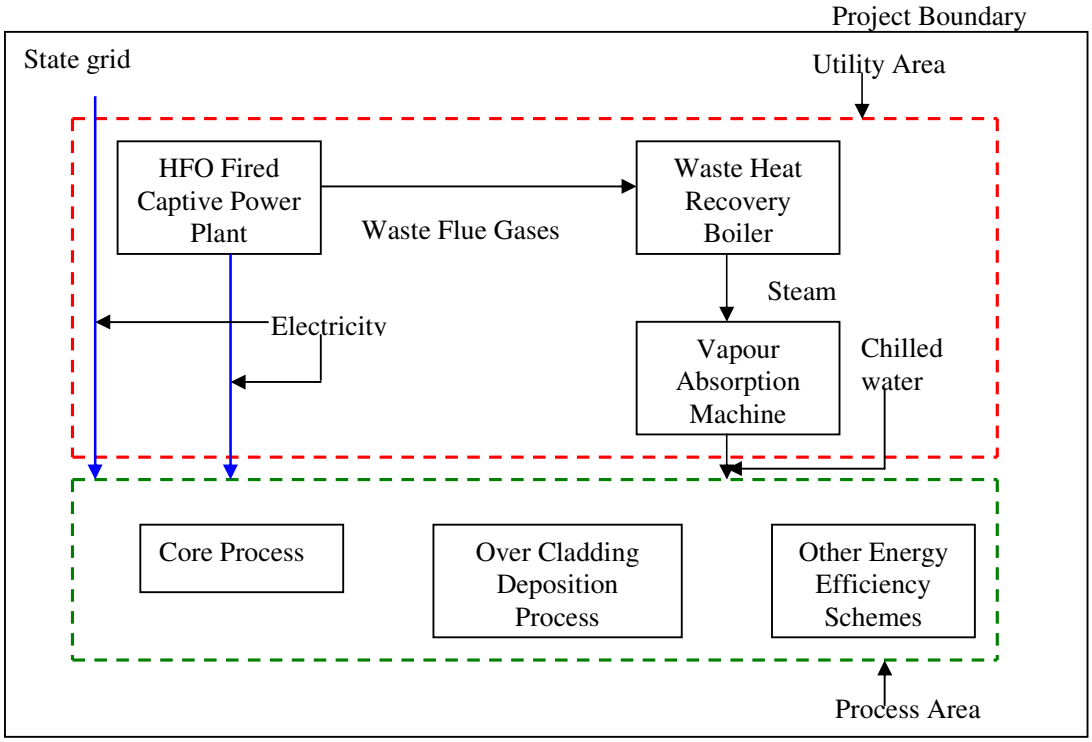
"Each energy form in the emission baseline is multiplied by an emission coefficient (in kg CO_2e/kWh). For the electricity displaced, the emission coefficient is calculated in accordance with provisions under category I.D. For fossil fuels, the IPCC default values for emission coefficients may be used."

The proposed activity has resulted in the reduction of electricity consumption. In the proposed baseline, Western Region grid is used as the reference region for estimating the current generation mix. Using the methodology available for small-scale project activities, the weighted average emissions (t CO_2 e/GWh) of current generation mix of Western Region grid of India is

used for the calculation of baseline. The weighted average emission factor data calculated and provided by Central Electricity Authority (CEA)[3] is used for the proposed project activity.

B.3. Description of the project boundary:

Project boundary includes all energy efficiency schemes listed in section A.4.2.



B.4. Description of baseline and its development:

The detailed computation of the energy baseline and emission baseline are based on the simplified baseline methodologies specified in Appendix B of simplified modalities and procedures for small scale CDM project activities.

In the proposed baseline, Western Region grid is used as the reference region for estimating the current generation mix. Using the methodology available for small-scale project activities, the weighted average emissions (t CO_2 e/GWh) of current generation mix of Western Region grid of India is used for the calculation of baseline. The weighted average emission factor data calculated and provided by Central Electricity Authority (CEA)[4] is used for the proposed project activity.

[3] http://cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

[4] http://cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

The proposed project activity intends to save import of electricity from the grid.

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:

The project reduces anthropogenic emission of greenhouse gases by source below those that would have occurred in the absence of the CDM project activity.

As per decision 17/cp.7 Para 43, a CDM project is additional if anthropogenic emission of greenhouse gases by source are below those that would have occurred in the absence of the CDM project activity.

- **Additionality**

According to Attachment A to Appendix B of the simplified modalities and procedures for CDM small-scale project activities, evidence to why the project is additional is offered under the following categories of barriers:

Project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;
b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;
c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;
d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

Identify barriers that would prevent the implementation of type of the proposed project activity. We have selected (b) (c) & (d) to provide an explanation.

(b) Technological Barriers:

Barrier	Narration	Remarks
Innovation - There was no process know-how for new technology adopted by SOTL and it had to be developed in-house.	SOTL could have continued using the existing conventional MCVD + Sleeving process which is a less technologically advanced alternative to the project activity and produces higher GHG emissions. MCVD + sleeving technology was supplied by ASI. While adopting the new process, there was no process know-how available to SOTL and there was no party, world-wide, which could provide such advanced technology.	--

	This technology had to be stabilised in-house by SOTL's own R & D efforts and lot of time had to be spent to arrive at acceptable fibre quality with this process. Even though now stabilized, there was always apprehension about the success of the efforts taken to develop the new process. SOTL is one of the very few companies in the world, and the only company in India, which uses this Core + Deposition process.	
Cleaner environment is required for the new process. - Cleanliness from the earlier Class 10000 to 1000 had to be maintained.	Since the new technology is an outside deposition process, unlike the earlier MCVD process (where the deposition is inside the glass tube), clean room environment plays very important role since any dust or impurity trapped inside the glass fibre deteriorates the optical properties of fibre and it goes as scrap fibre after having spent all kinds of raw materials, power, man-hours etc. SOTL had to improve the cleanliness from the earlier Class 10000 to Class 1000 level. To maintain Class 1000 level of cleanliness, SOTL has invested in chilling plants as well as large number of air handling units with cleaner up-stream and down-stream air filters.	--
There is a greater risk element in the new process due to increase in pre-form size which is now equivalent to 10 rods of the earlier process.	Earlier each MCVD machine was making 1 rod, so any defect on the rod resulted in defect of 1 rod only. Now that each pre-form size resulted from core process is equivalent to approximately 10 rods. Any defect of 1 pre-form size results in the defect of 10 rods. This causes a much greater loss to SOTL, if it happens.	10 times risk increment
Risk Increment - 30 MCVD machines were used to make the rods. Now only 2 machines are used for an equivalent production.	Earlier 30 MCVD machines were used to make the rods. So loss of production due to failure of one machine was 3.33 %. Now as only two machines are involved in production so loss due to failure of one machine is 50 %.	Chances of loss of production gone up from 3.3 % to 50 %.
Increase in chances of contamination due to drop in suction pressure causes damage to the fibre, as outside deposition is used.	In this outside deposition process, chances of product contamination are more. Any contamination during the manufacturing can spoil the finished fibre because of lack of strength or poor optical/physical properties. Any drop in suction inside the machine during manufacturing can leave soot particles on the pre-form and can cause fibre breaks while drawing & loss of	Fibre purity is a major concern

	properties of the fibre. Product travels in clean rooms. However, minor unavoidable contamination occurs in clean room. SOTL had to set up invest in Hydro Fluoric Acid Washing handling plant + antistatic bags to cover product after it is washed.	
Matching of the software of the new machines for Core + OVD into the existing Oracle system of SOTL was a great technological challenge.	Since all the machines are inbuilt with industrial PC for recipe control and data acquisition, different machines are running with different software's like lab view. Matching the software of the new machines and hooking them up with existing Oracle system was a difficult job. Many a time system response and Oracle LAN problems scrapped the products. SOTL has had to peruse these challenges on various fronts to overcome these barriers.	
For increasing the line speed of the draw tower from 900 mpm to 1500 mpm additional investment in special die and many other modifications were required.	The increase in drawing speed of the fibre from 900 mpm to 1500 mpm also required many modifications. As the fibre is coated with a special resin when it is being drawn and the resin is also cured by ultra violet lamps, special coating resins had to be developed and then U.V curing had to be done in the given set up so that the physical properties of the fibre could be maintained. At high speed, chances of fibre breakages are more. Any random breaking of the fibre had to be avoided, as the fibre is marketable in lengths of 25 kms only. To prevent breakages in the fibre due to high speed drawing, a new special customised die had to be developed which involved high investment.	Packing yield was a concern as fibre can be marketed in lengths of 25 kms. only. Any random breakage of the fibre below 25 kms. of length makes the fibre un-marketable.
Higher deterioration of WHRB	To have maximum efficiency from waste heat recovery boilers ash (soot) deposition over the tube had to be blown through chimney with the help of steam. After having blown the soot from chimney, it was found that it was settling on nearby areas of the plant. To address this problem, there was a mandate for no soot blowing but at the same time boiler efficiency has to be maintained. Hence, a 3 way damper modification was done to bring the standby boiler on line when one of the WHRB had to be cleaned. The objective was to clean the boiler soot internally with water instead of blowing. As the soot is contaminated with oxides of sulphur, wet washing of the tubes increases the chances of damage to the tubes which is extra cost carried by the company.	This may call for repair/ replacement of WHRB at a date earlier than expected.

(c) Regulatory Barriers :

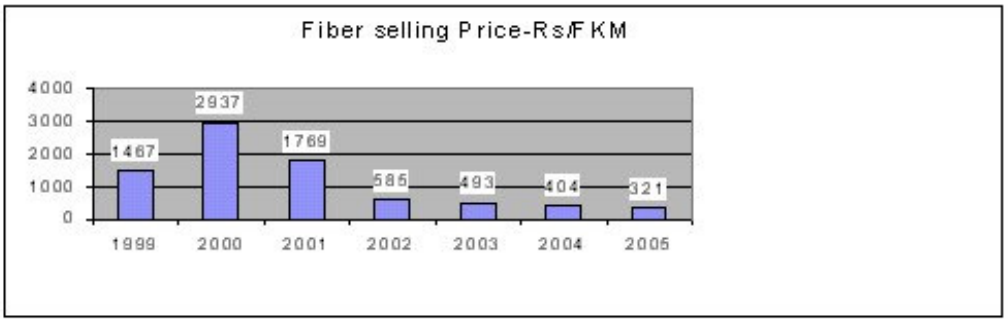
Barrier	Narration	Remarks
The project participant has to accept the norms set by Maharashtra Pollution Control Board (MPCB) for waste disposal and incur higher costs to meet these norms.	When SOTL decided to switch from "MCVD + Sleeving process" to "Core + OVD process", disposal of waste was a concern. In the earlier process, soot landfill as per norms laid by regulatory bodies was easier as the quantity of soot was less. Switching to new process increased the quantity of soot which had to be disposed off. As per subsequent regulation of MPCB, waste had to be disposed to authorized agencies like waste treatment companies at different locations. This regulation required additional costs to SOTL which had to be paid to waste treatment companies and SOTL had also to bear the cost for transporting the waste to them. In order to neutralise the higher quantities of HCl and toxic gases formed in the Core + OVD process, a new scrubbing system had to purchase. Further, the scrubber had to use caustic lye. This resulted in higher cost of caustic lye amounting to Rs. 3 Crore a year.	--

(d) Other Barriers:

(i) **Barriers in terms of investment**

Barrier	Narration	Remarks
SOTL could have purchased additional MCVD + Sleeving Machines at a lower cost than the cost incurred in the Core + OVD process.	If SOTL had continued to use the MCVD + Sleeving process, the additional investment for purchasing new MCVD and sleeving machines would have been lower than that required for developing the CORE + OVD process and purchasing the machinery for the same. However, as the MCVD + Sleeving process requires more electricity, it would have led to higher GHG emissions.	--
SOTL could have continued to use its conventional chilling plant without investing in a WHRB and VAMs	As the CPP was already running at full load, this alternative would require SOTL draw electricity from the State Utility grid. This alternative would require no additional investment but GHG emissions, in this case, would be higher.	
SOTL had to invest for project activity in a falling regime of the fibre optics	SOTL has had to make a greater investment in the new Core + OVD process and the use of WHRB and VAMs when the optical fibre market was falling in India and worldwide	# See following graph

market, world-wide		



Source : Graphs be Keith

Impact of CDM Revenue

The SOTL management took the decision to go ahead with the project activity in the midst of above risks/barriers. SOTL could have continued using the conventional process of which leads to energy wastage and hence, higher GHG emissions. Approval and registration of the innovative project activity as a CDM activity will enable the project proponent to access additional revenues by selling CO_2eq emission reductions. The ability to raise carbon finance partly mitigates the investment, technological and regulatory risks of the project.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Baseline methodology for projects under Type II.D has been detailed in Point No. 3 and 4 (Type II.D) of the above-mentioned document. Point No. 3, 4 & 5 (Type II.D) applies to this project activity, which states that:

3. In the case of replacement, modification or retrofit measures, the baseline consists of the energy baseline of the existing facility or sub-system that is replaced, modified or retrofitted. In the case of a new facility, the energy baseline consists of the facility that would otherwise be built.

4. In the absence of the CDM project activity, the existing facility would continue to consume energy (ECbaseline, in GWh/year) at historical average levels (EChistorical, in GWh/year), until the time at which the industrial or mining and mineral production facility would be likely to be replaced, modified or retrofitted in the absence of the CDM project activity (DATEBaselineRetrofit). From that point of time onwards, the baseline scenario is assumed to correspond to the project activity, and baseline energy consumption (ECbaseline) is assumed to equal project energy consumption (ECy, in GWh/year), and no emission reductions are assumed to occur.

ECbaseline = EChistorical until DATEBaselineRetrofit

ECbaseline = ECy on/after DATEBaselineRetrofit

In order to estimate the point in time when the existing equipment would need to be replaced in the absence of the project activity (DATEBaselineRetrofit), project participants may take the following approaches into account:

(a) The typical average technical lifetime of the equipment type may be determined and documented, taking into account common practices in the sector and country, e.g. based on industry surveys, statistics, technical literature, etc.

(b) The common practices of the responsible industry regarding replacement schedules may be evaluated and documented, e.g. based on historical replacement records for similar equipment. The point in time when the existing equipment would need to be replaced in the absence of the project activity should be chosen in a conservative manner, i.e. if a range is identified, the earliest date should be chosen.

5. Each energy form in the emission baseline is multiplied by an emission coefficient (in kg CO_2e/kWh). For the electricity displaced, the emission coefficient is calculated in accordance with provisions under category I.D. For fossil fuels, the IPCC default values for emission coefficients may be used.

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

(Copy this table for each data and parameter)

Data / Parameter:	**Electricity**
Data unit:	MWh
Description:	Electricity saving due to project activity
Source of data used:	Plant records
Value applied:	47730
Justification of the choice of data or description of measurement methods and procedures actually applied :	Automatically generated Oracle System
Any comment:	--

Data / Parameter:	CO_2 Emission Factor
Data unit:	t CO_2/MWh
Description:	Carbon Emission Factor
Source of data used:	Central Electricity Authority
Value applied:	0.874
Justification of the choice of data or description of measurement methods and procedures actually applied :	The used data is from an official source.

Any comment:	--

B.6.3 Ex-ante calculation of emission reductions:

Year	Estimation of project activity emission (tonnes CO_2e /yr.)	Baseline emissions (tonnes CO_2e /yr.)	Estimation of leakage (tonnes CO_2e / yr.)	Estimation of emission reduction (tonnes CO_2e /yr.)
2007-08 (Sept. onwards)	0	41716	0	41716
2008-09	0	41716	0	41716
2009-10	0	41716	0	41716
2010-11	0	41716	0	41716
2011-12	0	41716	0	41716
2012-13	0	41716	0	41716
2013-14	0	41716	0	41716
2014-15	0	41716	0	41716
2015-16	0	41716	0	41716
2016-17	0	41716	0	41716
Total	**0**	**417160**	**0**	**417160**

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

Baseline emissions are calculated as the electricity saved by the project activity multiplied by an emission coefficient for the Western Regional grid, calculated as the weighted average emissions (in kg CO_2equ/kWh) of the current generation mix.

$BE = EGy * CEF_{grid}$

Where EGy is the net quantity of electricity saved by the project in year y, and CEF_{grid} is the carbon emissions factor of the Western grid.

- **<u>Estimation of electricity saved due to proposed project activity</u>**

Step 1 – Electricity saved due to process change from MCVD + sleeving to Core + OVD

Sub – step 1 a – Hydrogen consumed / Fkm (fibre kilometre) in MCVD + Sleeving process

Hydrogen required for 450 km of process fibre = 600 nm^3

Out- put fibre = 254 Fkm

Hydrogen required for 1 Fkm = 600/254 nm^3/Fkm

= 2.36 nm^3/Fkm (1)

Sub – step 1 b – Hydrogen consumed / Fkm in Core + OVD process

Hydrogen required for 450 km of process fibre = 232 nm^3

Out- put fibre = 348 Fkm

Hydrogen required for 1 Fkm = 232/348 nm^3/Fkm

= 0.66 nm^3/Fkm (2)

Sub – step 1 c – Hydrogen saved / Fkm by process change [(1)- (2)]

= 1.7 nm^3/Fkm (3)

Sub – step 1 d – Electricity consumed in hydrogen plant

= 5.0 kWh /nm^3 (4)

Sub – step 1 e –Additional electricity consumed / Fkm by process change

= 1.3 kWh/Fkm (5)

Sub – step 1 f –Electricity saved / Fkm by process change {[(3)×(4)] – (5)}

= 1.7 × 5.0 – 1.3

= 7.2 kWh/Fkm (6)

Sub – step 1 f – Annual fibre production = 40, 00,000 Fkm (7)

Sub – step 1 f – Annual electricity saved by process change [(6) × (7)]

= 7.2 × 40, 00, 000/1000

= 28,800 MWh (8)

Step 2 – Electricity saved due to installation of WHRB and VAM

Sub – step 2 a – Plant refrigeration requirement for

(I) Process heat load = 300 TR

(II) Air-conditioning heat load = 700 TR

Total = 1,000 TR

Sub – step 2 b – Electricity load saving due to VAM

(I) Process heat load (reciprocating chillers) = 300 kW (1 kW = 1 TR)

(II) Air-conditioning heat load (Centrifugal Chillers) = 525 kW (1 TR = 0.75 kW)

Total = 825 kW (10)

Sub – step 2 c – Electricity saved /day due to VAM [(10) × 24 hours]

= 825 × 24

= 19,800 kWh/day (11)

Sub – step 2 d – Electricity saved /annum due to VAM [(11) × 355 days]

= 19,800 × 350/1,000 MWh

= 6,930 MWh (12)

Step 3 – Electricity saved due to other energy efficiency schemes

Sub – step 3 a – Electricity saving/Fkm due to other energy efficiency schemes

= 3 kWh /Fkm (13)

Sub – step 3 b – Electricity saving/annum due to other energy efficiency schemes [(7) × (13)]

= 40, 00, 000 × 3 /1000

= 12,000 MWh (14)

Total electricity saving / annum (8+12+14) ***= 47,730 MWh*** ***(15)***

Estimation of baseline or emission coefficient

It is calculated as:

Baseline emission coefficient (tCO_2 / MWh) = Total baseline emissions (tCO_2) / Total net generation (MWh)

= 0.92 t CO_2/MWh (CEA Data Source)

- **Estimation of baseline emissions**

Baseline emissions or CERs generated by the project are estimated as under:

Baseline emissions (tCO_2) = Emission coefficient (t CO_2/MWh) x Power saved from the project (MWh)

= 0.874 × 47730 MWh
= 41716 t CO_2

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:	**Electricity**
Data unit:	MWh
Description:	Electricity saved due to all activities
Source of data to be used:	Automatically generated Oracle system
Value of data	--
Description of measurement methods and procedures to be applied:	The value for all savings will be measured from automatic Oracle system
QA/QC procedures to be applied:	--
Any comment:	--

Data / Parameter:	**Hydrogen Consumption**
Data unit:	nm^3
Description:	Hydrogen consumption at all points
Source of data to be used:	Automatically generated Oracle system
Value of data	--
Description of measurement methods and procedures to be applied:	The value for Hydrogen consumption will be taken from automatic Oracle system
QA/QC procedures to be applied:	--
Any comment:	--

Data / Parameter:	**Tonnes of Refrigeration**
Data unit:	TR
Description:	Tonnes of Refrigeration generated by VAM
Source of data to be used:	SOTL readings
Value of data	--
Description of measurement methods and procedures to be applied:	The value will be monitored daily
QA/QC procedures to be applied:	--

Any comment:	--

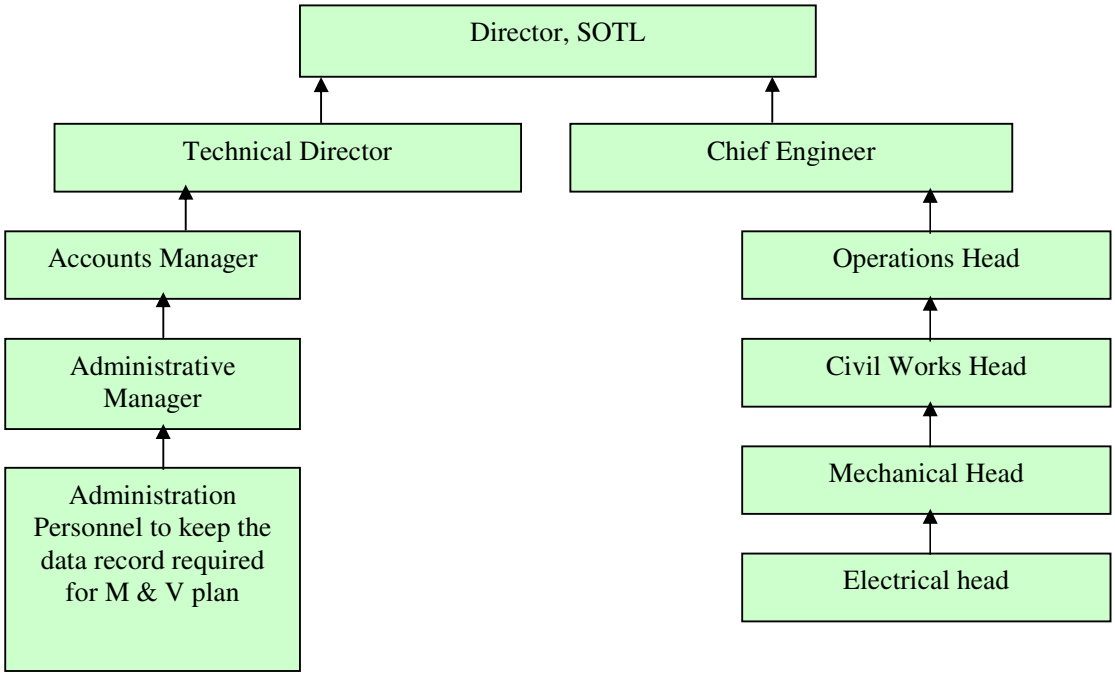
Data / Parameter:	**Day of operation**
Data unit:	days
Description:	Days of operation of plant
Source of data to be used:	SOTL readings
Value of data	--
Description of measurement methods and procedures to be applied:	The value will be from automatic Oracle system
QA/QC procedures to be applied:	--
Any comment:	--

B.7.2 Description of the monitoring plan:

Monitoring methodology / guidelines mentioned in the UNFCCC document of "Annex B of the simplified modalities and procedures for small scale CDM project activities" for small scale projects (Type – II: D) is considered as basis for monitoring methodology for the proposed activity.

The project proponent will monitor the electricity saved that otherwise would have been imported from the grid using meters installed at the project plant.

SOTL will form a CDM team comprising of persons from relevant departments, which will be responsible for monitoring of all the parameters mentioned in the section. In the CDM team, a special group of operators will be responsible of monitoring of different parameters and record keeping. On periodical basis, the monitoring reports will be checked and discussed. On monthly basis, report will be forwarded at the management level.



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

Date of completion of baseline and monitoring methodology – 25/01/2007

Name of the responsible person – Srterlite Optical Technolgies Limited has developed the baseline and monitoring methodology along with their consultants. Details are provided in Annex – I of the document.

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:

17/11/2000 (Purchase order for Core Machine)

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

20 Years

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

C.2.1. Renewable crediting period

Not Opted for.

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

Not applicable

C.2.1.2. Length of the first crediting period:

Not applicable

C.2.2. Fixed crediting period:

Opted for.

C.2.2.1. Starting date:

September 15, 2007 or date of registration with CDM EB, whichever is later.

C.2.2.2. Length:

10 years.

SECTION D. Environmental impacts

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

The only environmental impacts from the proposed project activity are reduction in use of electricity consumption and associated pollution. There are no negative environmental impacts from these project activities beside some acidic fumes produced. At SOTL, along with new process technology, scrubbing system is installed to mitigate the environmental impact. The project activities do not require an environmental impact assessment (EIA) under Indian law. The socio-economic and cultural environment is also not affected in any way due to implementation of the project.

All legal clearances were secured for implementation of the project activity.

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:

Though there is no apparent environmental impact of project activity, SOTL has considered the environmental impact of project activity as significant (if any) and took all necessary action.

The considerations are as follows –

Waste Cat.	Waste details	Disposal
Solid waste	Sludge	Land filling as per MPCB compliance to MWML
Gaseous waste	Neutralized gases	Stack to atmosphere, monitored, MPCB complied

In optical fibre manufacturing, the first stage raw material are halides, silicon tetra chlorides ($SiCl_4$), germanium tetra chloride ($GeCl_4$) & phosphorous oxy chlorides ($POCl_3$) These are reacted inside high purity quartz glass tube to form high purity glass. Acid fume of HCL & some amount of silica dust is produced in the reaction as waste.

In the second stage, the deposited silica in the form of solid rod is jacketed with glass tube. The tube used to jacket is also deposited by reacting silicon tetrachloride with O_2 on the outside of the glass rod produced in 1st stage. The waste generated from the process is sent to scrubber for treatment & scrubber waste is sent to ETP for treatment.

Scrubber - Exhaust from various machines are provided with efficient suction to capture & carry acidic gases & dust particle to the scrubber system. First of all dust particles are captured as well as acidic gases are neutralised partially by circulating caustic solution. This is called as ventury scrubber (1st stage of scrubber) followed by column scrubber (2nd stage of scrubber) where un-scrubbed acidic gases are further scrubbed by circulation caustic solution & then vent out to atmosphere through stack height of 30 meter from ground level. The vented gases contain HCL (less than 35 mg/nm^3), chlorine (less than 15 mg/nm^3) and Particulate matter (less than 150 mg/nm^3).

SECTION E. Stakeholders' comments

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

The project activity is executed and operated within the existing operational plant. There are well established procedures within the company for involving technical as well as operating staff in the decision making for implementation of any project. An internal note was circulated through all key departments within the plant concerned with the area of project activity. Comments from the department chief were also invited.

E.2. Summary of the comments received:

As the plant is located in dedicated industrial area away from population, so, the project activity will not cause any adverse social impact on the local population. It will have benefits for the society at large by conserving energy and thus taking one step ahead towards sustainable development.

There are no negative impacts of the project in any way on any stakeholder. In fact they appreciated the efforts towards energy conservation and the environmental benefits that the

project activity has resulted into. The comments from internal stakeholder's viz. contract personnel, operators and supervisors were sought for the project.

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

Stakeholders have appraised the project as an environment friendly project and have expressed their satisfaction on the fact that it reduces emissions and contributes to well-being of society. There are no negative comments received that require the project proponent to take any corrective action.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Sterlite Optical technologies Limited
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Represented by:	
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Direct FAX:	-----
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

- The project has not received any public funding and Official Development Assistance (ODA).
- The project is a unilateral project.

Annex 3

BASELINE INFORMATION

In the proposed baseline, Western Region grid is used as the reference region for estimating the current generation mix. Using the methodology available for small-scale project activities, the weighted average emissions (in tCO_2 e/GWh) of current generation mix of Western Region grid of India is used for the calculation of baseline. The weighted average emission factor data calculated and provided by Central Electricity Authority (CEA)[5] is used for the proposed project activity.

The procedures and formulas used in the estimation of baseline factor and the assumptions made have also been detailed there.

Baseline Emmision	**0.874**	**tCO2/MWh**
Project Emmision	**0**	**tCO2/MWh**

Baseline Emission					
Year	**Units (MWh)**	**Baseline Emission**	**Project Emission**	**Leakage**	**Emission Reduction tCO2**
2007-08	47730	41716	0	0	41716
2008-09	47730	41716	0	0	41716
2009-10	47730	41716	0	0	41716
2010-11	47730	41716	0	0	41716
2011-12	47730	41716	0	0	41716
2012-13	47730	41716	0	0	41716
2013-14	47730	41716	0	0	41716
2014-15	47730	41716	0	0	41716
2015-16	47730	41716	0	0	41716
2016-17	47730	41716	0	0	41716
Total	**477300**	**417160**	**0**	**0**	**417160**
Annual Average	47730	41716	0	0	41716

[5] http://cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

Annex 4

MONITORING INFORMATION

A proper Monitoring & Verification (M&V) Plan has been developed by SOTL for proper monitoring and verification of actual GHG emission reductions at the plant from the project activity.

The Monitoring and Verification (M&V) procedures define a project-specific standard against which the project's performance (i.e. GHG reductions) and conformance with all relevant criteria will be monitored and verified. It includes developing suitable data collection methods and data interpretation techniques for monitoring and verification of GHG emissions with specific focus on technical / efficiency / performance parameters. It also allows scope for review, scrutiny and benchmarking of all these information against reports pertaining to M & V protocols. The M&V Protocol provides a range of data measurement, estimation and collection options/techniques in each case indicating preferred options consistent with good practices to allow project managers and operational staff, auditors, and verifiers to apply the most practical and cost-effective measurement approaches to the project. The aim is to enable this project have a clear, credible, and accurate set of monitoring, evaluation and verification procedures. The purpose of these procedures would be to direct and support continuous monitoring of project performance/key project indicators to determine project outcomes and resultant greenhouse gas (GHG) emission reductions.

The project activity's revenue is based on the units (kWh) saved in comparison to the units (kWh) consumed before the implementation of the project, measured by power meters at plant. The monitoring and verification system would mainly comprise of these meters as far as power import and savings of energy is concerned.

The other project specific parameter and performance indicators are: -

- Specific electrical energy consumption by the considered schemes.
- Operating hours of the particular equipment under project activity.

Monitoring and verification of raw material quantity is also required to be monitored as it could influence change in efficiency of the equipments and hence the quantum of emission reductions in tonnes of CO_2 equivalent.

The project has employed the state of the art monitoring and control equipment that measure; record, report, monitor and control mentioned key parameters. The instrumentation systems for monitoring of the project mostly comprise microprocessor-based instruments of reputed make with desired level of accuracy. All instruments are calibrated and marked at regular intervals so that the accuracy of measurement can be ensured all the time.

Justification of choice of methodology

Project activity includes energy efficiency improvement measures resulting in savings of electrical power consumption.

The project monitoring includes:

- Monitoring the performance of newly adopted measures,
- Metering the specific electrical energy consumption by the specified equipments
- The output ton of refrigeration (TR)
- Operating hours.
- Down time of the CPP.
- Calculating the difference in specific electrical energy consumption after and before project implementation, which is equivalent to total energy saved at the grid.

According to UNFCCC document for choice of monitoring methodology - Appendix B of the simplified M&P for small-scale CDM project activities also suggests the same for similar projects under Category II.D in the paragraphs 6 (a), (b) and (c).

The quantity of emission reduction unit claimed by the project will be the total electrical energy saved by the measures of plant.

Project parameters affecting emission reduction:

The parameters that affect project emission are as follows:

a) Quantity of material input that the equipment handle
b) Quantity of energy input
c) Operating parameter

Western grid has been identified as emission baseline systems and project activity would affect this system.

GHG Sources

There is no direct onsite emission from the project activity. Also there had been no additional construction work involved for project specific requirement, hence no indirect onsite emission. The indirect off-site GHG source is the emission of GHG's that are involved in the process of transportation for procurement of equipments. However, considering the life cycle of the project activity and the emissions to be avoided in the life span of 20 years emissions from the above-mentioned source are too small and hence neglected. Project positively reduces GHGs at the thermal power unit connected to the western grid as direct off-site reduction.

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