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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Reduction in Specific Steam Consumption of Vapour Absorption Chillers at Indo Rama Synthetics (India) Limited, Butibori, Distt- Nagpur, Maharashtra.

Version: 03

Date: 13/05/2008

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

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Indo Rama Synthetics (India) Limited (IRSL) has a synthetic fibre complex at Butibori, Nagpur District, Maharashtra. IRSL fibre complex has facility to manufacture Polyester Chips, Partially Oriented Yarn (POY), Polyester Staple Fibre (PSF) and Draw Twisted Yarn (DTY).

Chilled water is used to meet the process air conditioning requirements for POY, PSF and DTY manufacturing section of IRSL. The chilled water requirement of IRSL is catered to by operating Vapour Absorption Chillers (VACs). Indo Rama has in place ISO-9001 (2000) for highest standard of Quality Management System (QMS), ISO-14001 (2004) for Environment Management System (EMS), OSHAS-18001 (Occupational Safety & Health) & Social Accountability (SA8000) and OEKO Tex certificate to meet Human Ecological requirements. IRSL being a progressive organisation, continuously explores various possibilities to achieve higher energy efficiency and improvement in environmental performance.

Purpose of the Project Activity

The purpose of IRSL project activity is to achieve higher energy efficiency by installation of new higher energy efficient VACs in place of old less energy efficient VACs and to reduce the green house gas emission (GHG) emissions. The new higher energy efficient VACs would reduce the over all energy demand for air conditioning and helps in improving the energy and environmental performance of the complex. In the pre-project scenario, IRSL were operating eight numbers of VACs of 1125 TR each to cater the chilled water requirement in the fibre complex, the specific steam consumption of existing VACs varies in the range of 5.0 kg/TR -5.4 kg /TR.

The IRSL project activity involves replacement of three numbers of existing lower energy efficient VACs with new higher energy efficient VACs (2 x 1240 TR and 1 x 1150 TR) in a phased manner. The replacement of less energy efficient VACs with more energy efficient VACs will reduce the specific steam consumption of VACs and thereby reduces the over all steam demand. Since the steam is generated

by fossil fuel fired boiler, reduce in the overall steam demand will reduce the fossil fuel consumption and subsequently reduces the GHG emission.

Project's contribution to sustainable development

The contributions of project activity towards sustainable development are explained with indicators like socio-economic, environment and technological well being, as follows:

Socio-economic well being:

Business opportunities for local stakeholders such as consultants, suppliers, manufacturers, contractors, skilled-semiskilled workmen etc are envisaged during various phases of the project activity - Planning, Implementation and Operation.

Fossil fuel saved due to project activity, can be utilized for other needy sections of the economy.

Environmental well being:

The project activity would result in saving of fossil fuel in boiler and thereby reduction in equivalent amount of CO_2 emissions. The fossil fuel savings also leads to reduction in Greenhouse Gas (GHG) emissions due to fuel processing and transportation.

Technological well being:

The project activity involves implementation of a new energy efficient VACs of 1240 TR and 1150 TR. These new replaced VACs are designed with new generation corrosion inhibitor (Lithium Molybdate) and Plate type heat exchangers of higher heat transfer coefficient. The project activity has the good replication potential in the Indian textile industry segment.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host party)	Private and/or public entity(ies) Project participants(*) (as applicable)	Party involved wishes to be considered as project participant (Yes/No)
India (host)	Indo Rama Synthetics (India) Limited (IRSL)	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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Maharashtra

A.4.1.3. City/Town/Community etc:

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Village - Butibori, Distt- Nagpur

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

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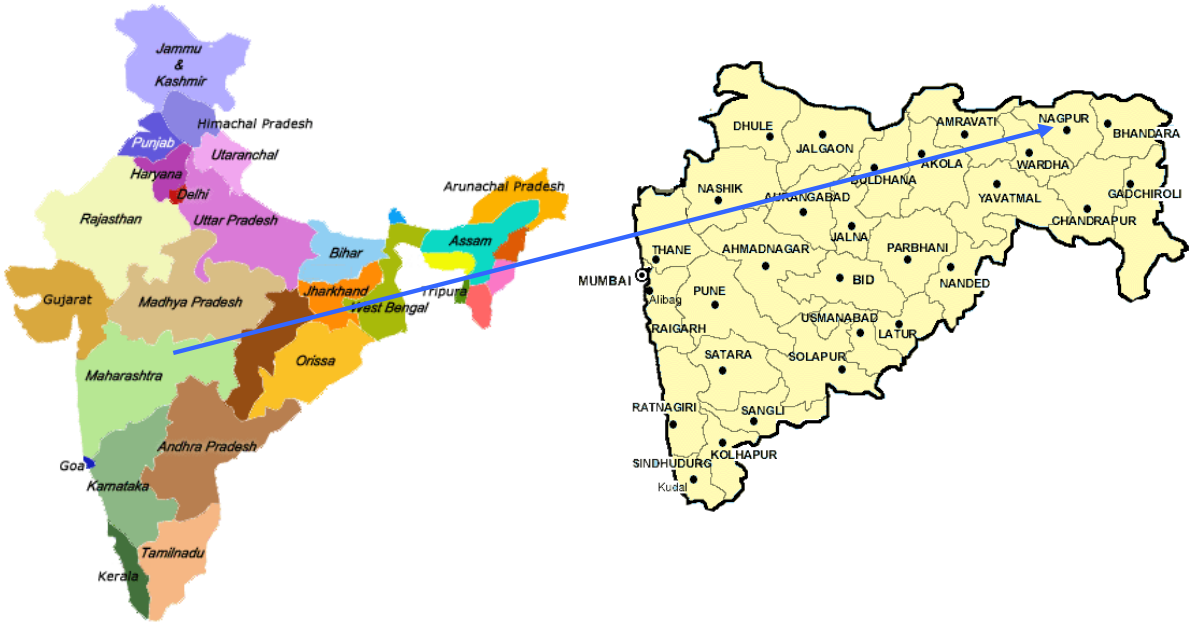
The project activity is located at Indo Rama Synthetics (India) Limited (IRSL), Butibori Distt- Nagpur, Maharashtra, India. The synthetic fibre complex of IRSL is situated at A-31, MIDC Industrial Area Village- Butibori (PIN-441122), about 25 km from District Nagpur. The nearest railway station and nearest airport is Nagpur.

The geographical location of the project activity is:

Geographical Coordinates: Latitude : 21.09° North

Longitude : 79.09° East



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

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Type and Category of Project Activity

IRSL project activity meets the applicability criteria of the small-scale CDM project activity category, Type - II: Energy Efficiency Improvement Projects (II.D: Energy efficiency and fuel switching measures for industrial facilities, Version 11, EB-35) of the 'Indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories'.

Main Category: Type II - Energy Efficiency Improvement Projects

Sub Category: II.D - Energy Efficiency and Fuel Switching Measures for Industrial Facilities

As per the provisions of appendix B of simplified modalities and procedures for small scale CDM project activities (Version 11, EB 35), Type II D "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".

As per project activity Type – II.D. (reference Annex B of simplified modalities and procedures for small-scale CDM project activities):

- The aggregate energy savings of a single project may not exceed the equivalent of 60 GWhe per year. A total saving of 60 GWhe per year is equivalent to a maximal saving of 180 GWhth per year in fuel input." The project activity is within the threshold values stated by the methodology.
- The baseline and emission reduction calculations from the project would be based on paragraphs 5, 6, and 7 of II D of appendix B (version 11, EB35) and the monitoring methodology would be based on guidance provided in paragraphs 9 and 10 of II D of the same appendix B.

The project activity meets the eligibility criteria since the maximum saving[1] in energy input is 18.82 $GWh_{th;}$ which is less than 180 GWh_{th} per year.

Technology of project activity

The technology to be employed in the project activity is given below:

Equipment	: Chiller
Type	: Vapour Absorption
Refrigerant	: Water
Absorbent	: LiBr
Energy Supply	: Steam

[1] Please refer emission reduction calculation excel sheet for detail calculation

Capacity : 2X1240 TR, 1X1150 TR

Specific Steam Consumption : 3.9 kg/hr/TR

Corrosion Inhibitor : Lithium Molybdate

The specifications of the VACs

S.No.	Description	VAC A	VAC B	VAC F
Pre – Project details				
1	Capacity, TR	1125	1125	1125
2	Type of chiller	Vapour absorption	Vapour absorption	Vapour absorption
3	Refrigerant	Water	Water	Water
4	Absorbent	LiBr	LiBr	LiBr
5	Energy supply	Steam	Steam	Steam
6	Specific steam consumption , kg/hr/TR(Design)	5.4	5.4	5.4
7	Corrosion inhibitor	Chromate	Chromate	Chromate
Post – Project details				
1	Capacity, TR	1240	1240	1150
2	Type of chiller	Vapour absorption	Vapour absorption	Vapour absorption
3	Refrigerant	Water	Water	Water
4	Absorbent	LiBr	LiBr	LiBr
5	Energy supply	Steam	Steam	Steam
6	Specific steam consumption , kg/TR/hr(Design)	3.9	3.9	3.9
7	Corrosion inhibitor	Molybdate	Molybdate	Molybdate

The IRSL project activity includes the phase wise installation of new higher energy efficient VACs to replace the old less efficient VACs, the installation schedule for the new VACs is given below:

VAC	Date of installation
VAC-A	10.08.2004
VAC-B	20.07.2004
VAC-F	25.01.2007

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

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The project activity leads to GHG emission reductions of around 65100 tonnes of CO_2e over a 10 year crediting period.

Years	Annual Estimation of emission reduction in tonnes of CO_2e
2008-2009	6510
2009-2010	6510
2010-2011	6510
2011-2012	6510
2012-2013	6510
2013-2014	6510
2014-2015	6510
2015-2016	6510
2016-2017	6510
2017-2018	6510
Total estimated reductions (tonnes of CO_2e)	65100
Total number of crediting years	**10 years**
Annual Average over the crediting period of estimated reduction (tonnes of CO_2e)	**6510**

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

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No public funding as part of project financing from parties included in Annex I of the convention is involved in the project activity.

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

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The guideline for de-bundling mentioned in paragraph 2 of appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities is given as follows:

"A proposed small scale project activity shall be deemed to be a de-bundled 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
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point".

The project proponent is proposing another energy efficiency project "Energy Efficiency Improvement in Thermosetting process at Indo Rama Synthetics (India) Limited, Butibori, Maharashtra, India." in same project category at same location.

The technology adopted in thermosetting process project is different from technology adopted in VAC (project activity considered in this PDD). Hence, the proposed project is not a de-bundled component of a large 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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The project activity satisfies the eligibility criteria to adopted simplified modalities and procedure for small-scale CDM project activities as explained in paragraph 6 (c) of decision 17/CP.7. Details of methodology for baseline calculations for small-scale CDM projects are referred from the "Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories". Reference has been taken from Main Category:

Type II –Energy Efficiency Improvement Project;

Sub Category: II.D – Energy efficiency and fuel switching measures for industrial (Version 11, EB 35)

Reference: UNFCCC CDM website[2]

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

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The project activity falls under **Type II –Energy Efficiency Improvement Project; Sub Category: II.D – Energy efficiency and fuel switching measures for industrial facilities.** The applied methodology AMS II.D (version 11, EB 35) has the following applicability criteria:

1. 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.

[2] http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

2. This category is applicable to project activities where it is possible to directly measure and record the energy use within the project boundary (e.g. electricity and/or fossil fuel consumption).
3. This category is applicable to project activities where the impact of the measures implemented (improvements in energy efficiency) by the project activity can be clearly distinguished from changes in energy use due to other variables not influenced by the project activity (signal to noise ratio).

The project activity fulfils all the requirements of the applied methodology in ensuing manner:

I. The project activity is installed at single industrial facility i.e Indo Rama Synthetics (I) Ltd, Butibori, Nagpur –Maharashtra.
II. The project activity primarily aims to increase energy efficiency at IRSL fibre complex by replacing less energy efficient VACs with higher energy efficient VACs.
III. The aggregate energy savings[3] from the IRSL project activity is 18.82 GWh_{th} ; which is less then 180 GWh_{th} per year in fuel input.
IV. The project activity reduces the specific energy consumption of VACs (kg/TR). The steam consumption by the new high efficient VACs is directly measured by the steam flow meter and recorded as per the standard procedure of IRSL. Hence it is possible directly measure and record the energy use within the project boundary.
V. The project activity directly affect the specific steam consumption of the VACs also, there is no other variable directly affect by the project activity.

Thus, the proposed project activity fulfils all the applicability criteria of the applied methodology II.D. (Version 11, EB 35).

B.3. Description of the project boundary:

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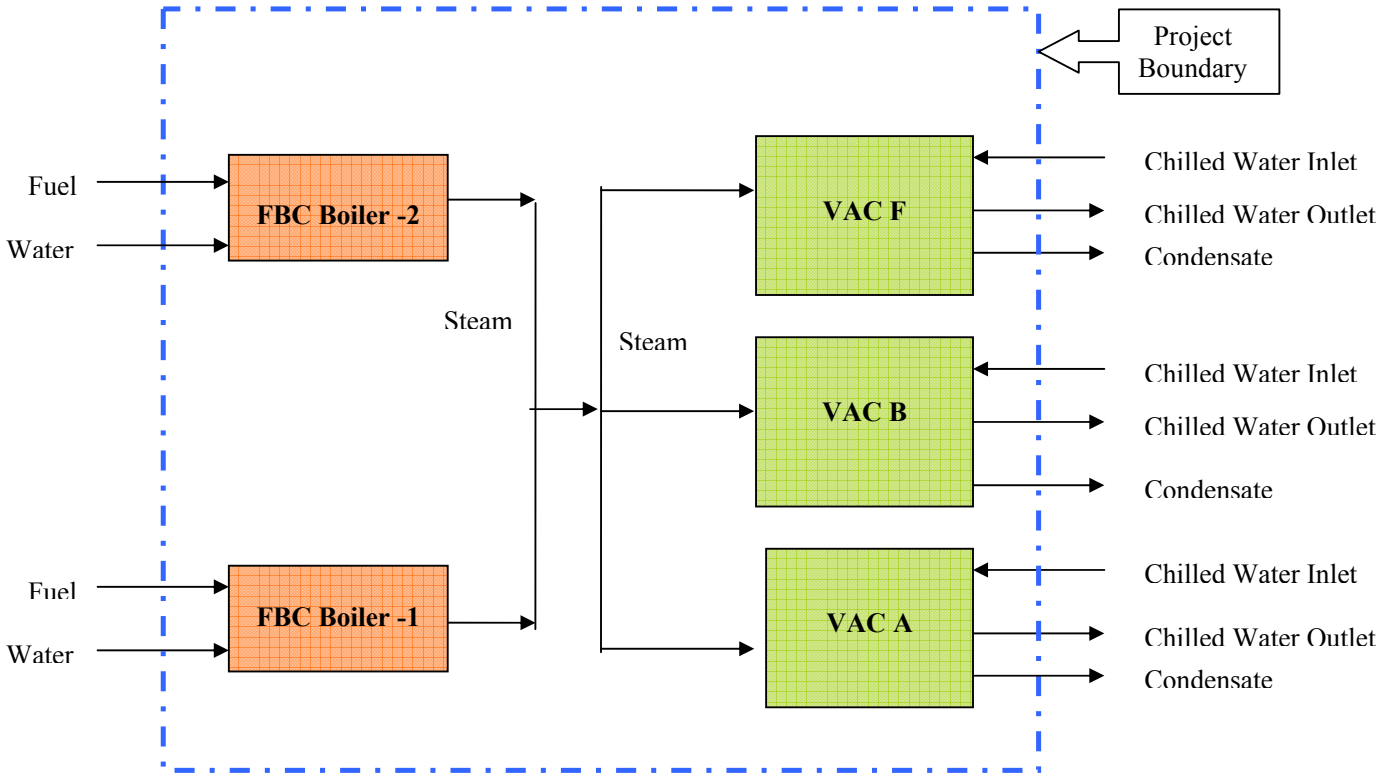
As per the guidelines provided in the paragraph 4 of approved methodology AMS II.D.(Version 11, EB35), "The project boundary is the physical, geographical site of the industrial or mining and mineral production facility, processes or equipment that are affected by the project activity."

[3] CER emission reduction calculation excel sheet

Since the project activity involves the replacement of less efficient VACs with higher energy efficient VACs at IRSL fibre complex, Butibori (Maharashtra). The project boundary includes the replaced VACs and source of steam generation.



B.4. Description of baseline and its development:

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As per the "Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories" baseline for the proposed project activity has been estimated. Type II – Energy Efficiency Improvement Projects, II.D. (Version 11, EB 35) Energy efficiency and fuel switching measures for industrial facilities, baseline is defined in paragraph 5, 6 and 7 as:

5. 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.

The proposed project activity involves the replacement of existing less energy efficient VACs with higher energy efficient VACs. Hence, the specific steam consumption (kg/TR) of the existing less energy efficient VACs is considered as energy baseline. Specific steam consumption by the existing VACs is calculated from the one-year historical data of steam consumption and TR generated by the less energy efficient VACs.

6. 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 consider the following approaches:

(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.

The existing less energy efficient VACs had a significant operational lifetime and was not likely to be replaced within the crediting period. Hence, in absence of the project activity, existing less energy efficient VACs would have continued to operate and leading to higher specific steam consumption (higher energy at historical average levels). Therefore, no change is anticipated in the above-mentioned baseline, within the crediting period.

7. Each energy form in the emission baseline is multiplied by an emission coefficient (in kg CO2e/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 project activity reduces the specific steam consumption (kg of steam/TR) in the project case; steam (thermal energy) is supplied by fossil fuel (coal) combustion boilers. Hence, to estimate the baseline and project emission, thermal energy is multiplied by IPCC emission factor of coal.

Date of completion of the baseline: 04/04/2008

Name of person/entity determining the baseline: Mr. Vivek Kaul
M/s Indo Rama Synthetics (India) Limited
Dr. Gopal Das Bhawan, 4th Floor
28, Barakhamba Road,
New Delhi-110001

The detail of the project participant is enclosed in Annex 1 of this document.

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 activity reduces anthropogenic emissions of greenhouse gases (GHG) by sources below those that would have occurred in absence of the registered CDM project activity.

As per the decision 17/cp.7 Para 43, a CDM project activity is additional if anthropogenic emissions of greenhouse gases (GHG) by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.

Barriers and Additionality

As per Appendix B "Indicative Simplified baseline and monitoring methodologies for selected small scale CDM project activity categories" of the simplified modalities and procedures for small-scale CDM project activities. The attachment A of appendix B states that 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) Barrier due to prevailing Practice

(b) Technological Barriers

The following section addresses the barriers associated with IRSL project activity.

Barriers due to prevailing practice

IRSL project activity involves the replacement of three numbers of lower energy efficient VACs of 1125 TR capacity each by higher energy efficient VACs (two 1240 TR and one 1150 TR). The specific steam consumption ratio of low energy efficient VACs are in the range of 5.0 to 5.4 kg/hr/TR. Based on experience, IRSL explored opportunities to replace the existing lower energy efficient VACs by higher energy efficient VACs . The high capacity energy efficient VACs were not readily available in the market, IRSL consulted various equipment suppliers on continual basis to explore different opportunities to reduce the specific steam consumption ratio of VACs.

The IRSL project activity "Reduction in Specific Steam Consumption of Vapour Absorption Chillers" (VACs) by replacing with higher energy efficient VACs is first of its kind in Indian textile sector. The project activity is not a prevailing practice in textile industry in India. Therefore IRSL lacked the familiarity about the technology. Installing VACs of these higher capacities such as 1240 TR and 1150 TR with new advance technology is not a common practice in Indian Textile industry.

In absence of any precedence of successful implementation of similar new technology based higher capacity VACs, IRSL has taken huge risk to install the energy efficient, high capacity VACs at Butibori unit.

Technological Barrier(s)

At the IRSL synthetic fibre complex, chilled water plays vital role in manufacturing process and quality of POY, PSF & DTY. The production process and quality of the POY, PSF & DTY is greatly affected by ambient conditions like atmospheric temperature and relative humidity etc., Specific temperature and humidity is required to stabilize the property of yarn/fibre.

Hence the POY, PSF & DTY sections are air conditioned and temperature, humidity is controlled according to process requirements. To cater to the air conditioning requirements, VACs are installed. Any disruption in VACs operation would affect process air conditioning and subsequently would affect production process of the POY, PSF & DTY

In order to reduce Specific Steam consumption the following modifications or newly designed equipments are added in the new VACs:

- Heat Reclamier (HR) design modification for pressurized steam
- Plate type heat exchanger

These above mentioned modifications or newly designed equipments in the new VACs would help in reducing steam consumption of VACs, but also increases the risk of breakdown of new VACs on account of any failures like tube failure in heat reclaimer due to high pressure steam etc.,

The VACs use Lithium bromide (LiBr) as absorbent any leakage of LiBr (on account of tube failure in the heat exchanger etc.,) into steam condensate may create following problems which may affect operation of VAC/ operation of boiler. Any disruption in operation of VAC/boiler would affect production processes and IRSL would incur huge production losses.

- Since many modifications like usage of high pressure steam in Heat Reclaimer etc., are carried out in the new VACs, their exist a risk of breakdown of the VAC on account of problems like tube failure in heat reclaimer due to high pressure steam etc., Under this scenario, LiBr which is a toxic substance may leak into steam condensate and it can contaminate the condensate returning from VAC. The condensate returning from VAC is fed as feed water to FBC boiler. Any contamination in Feed water to FBC may create erosion problem in boiler tubes and boiler tube leakage would lead to shutdown of boilers.

  Since steam is an imperative input to production process, shutdown of boilers would disrupt production process and would lead to production losses.
- The high filtration losses of lithium bromide may cause plugging of the heat exchangers and would reduce the effective area for heat transfer in respective equipment, hence the capacity of the equipment reduces and leading to higher cost of operation. Under this scenario, VAC may experience choking problems in absorber tray leading to shut down of VAC. This would affect the production process.
- As the new VACs are using LiBr as an absorbent their exists an operational risk, if the concentration of LiBr in the solution increases and the vapour pressure drops, there is an increased possibility for Li-Br salt to crystallize. The crystallization problem would reduce the effective heat exchange area and significantly affect the performance of VACs, leading to reduction in chiller tonnage and subsequently affect production process.

IRSL would face huge technical barriers and operational risk by implementing the project activity. Though the employees of IRSL provided training on normal operation of new VAC but they are not experienced to handle the critical conditions as mentioned above arises and causes the failure or brake down of the VAC Machines. The CDM revenue from the project activity would help IRSL in mitigating or covering up the technological/operational risks of the project.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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There is no specific formula available for emission reduction calculation in the applied methodology AMS. II.D. hence, the baseline emission, project emission and leakage is calculated from the guidelines provided in the paragraph 5, 6, 7 and 8 of the applied methodology AMS II.D. (Version 11, EB 35). The approach adopted for calculating emission reduction due to implementation of project activity is explained below:

Since, the project activity replaces the existing less energy efficient VACs with the new higher energy efficient VACs, thus reduction in the Specific Steam Consumption (SSC, kg/TR) of Vapour Absorption Chillers (VACs) are used for emission reduction calculation. For projection of baseline, project emission and annual CO_2 emission reduction; 300 working days are assumed; however, during monitoring period actual annual working days of VAC will be use for annual CO_2 emission reduction calculation.

The emission reduction calculation of the project activity is calculated as per following steps:

Baseline Emissions

In the absence of the project activity, the existing VACs with higher thermal energy/steam consumption would have operated and would lead to increase in steam demand of the complex and higher GHG emissions. The baseline emissions attributable to the specific steam by existing VACs and amount of GHG emissions due to combustion of equivalent amount of fossil fuel to cater to the higher steam demand in absence of the project activity.

Step 01: The specific steam consumption (SSC) of VACs is calculated from the actual TR generated by existing chiller and actual steam consumption of VACs in base case (SSC_{BL}).

Step 02: By multiplying the specific steam consumption (SSC_{BL}) of existing VACs and rated TR of VACs, LP steam consumption is calculated. Subsequently total input energy (which would have been required for the equivalent quantity of additional steam generated in absence of the project activity) to the boiler is calculated from the enthalpy of steam and boiler efficiency.

Step 03: the Baseline (BE_y) for the project activity is estimated from total energy input to the boiler (FBC boiler) and emission factor of fuels used in the boiler.

One-year historic monitored data from 1st August 2003 to 31st July 2004 is used to estimate the baseline emission. One-year data is used for baseline fixation, since it considers all seasonal variations (summer and winter season). The specific steam consumption of new VACs guaranteed by the equipment supplier is used as project specific steam consumption (SSC_{PL}). However, during the verification actual specific steam consumption ratio shall calculate from actual steam consumed and TR generated by the new VACs.

The procedure applied to calculate project emissions, baseline emissions, leakage emissions and emission reductions attributable to the energy efficiency in process air compressor is the following:

Project Emissions

The anticipated project emission due to implementation of the project activity is GHG emissions associated with VACs operation. VAC requires thermal energy (Steam) for its operation, IRSL explored possibility to reduce the thermal energy / steam consumption of VACs by implementing new higher energy efficient VACs. The thermal energy (steam) heat requirement of the VACs is catered by fossil duel based boiler. However, any reduction in thermal energy/steam consumption would reduce the GHG emission due to fuel consumption in boiler. The project emissions due to operation/steam consumption of new high efficient are considered for emission reduction calculation.

Step 01: The specific steam consumption (SSC) of VACs shall be calculate from the actual TR generated by VACs and actual steam consumption of VACs in project case (SSC_{PL}). The specific steam consumption of new VACs guaranteed by the equipment supplier is used as project specific steam consumption (SSC_{PL})

Step 02: By multiplying the specific steam consumption (SSC_{PL}) of new VACs and rated TR of VACs, LP steam consumption is calculated. Subsequently total input energy (which would have been required for the equivalent quantity of additional steam generated in absence of the project activity) to the boiler is calculated from the enthalpy of steam and boiler efficiency.

Step 03: Project emission s (PE_y) shall be calculated from the total energy input to the boiler (FBC boiler) and emission factor of fuels used in the boiler.

Leakage Emissions

As per paragraph 8 of the applied methodology AMS.II.D. It has been specified that:

8. If the energy efficiency technology is equipment transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.

The proposed project activity does not involved the equipment transfer from other activity also the existing less efficient VACs are not transferred to other project activity. Hence leakage is not considered due to the project activity.

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

Data / Parameter:	**S_{BL}**
Data unit:	Tonne/day

Description:	Quantity of Steam consumed in VACs (A, B and F) during baseline
Source of data used:	VAC log sheet
Value applied:	VAC-A: 59321 VAC-B: 57763 VAC-F: 69646
Justification of the choice of data or description of measurement methods and procedures actually applied :	Steam flow rate is measured at headers by online steam flow meter with integrator. The accuracy of steam flow meter is ±0.075 % of calibrated span. This parameter is used to calculate the baseline specific steam consumption of VACs.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	**P_{steam}**
Data unit:	Kg/cm^2
Description:	Pressure of inlet Steam to VACs (A, B and F)
Source of data used:	VAC log sheet
Value applied:	8.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	Steam pressure is measured at common header by online pressure gauge. The accuracy of pressure gauge is ±1%. This parameter is used to calculate the enthalpy of steam.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	**T_c**
Data unit:	ºC
Description:	Temperature of condensate from VACs (A, B and F)

Source of data used:	VAC log sheet
Value applied:	VAC A- 84 VAC B- 85 VAC F- 82
Justification of the choice of data or description of measurement methods and procedures actually applied :	Condensate temperature is measured by temperature sensor. The accuracy of temperature censor is ±1%. This parameter is used to calculate the enthalpy of steam.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	**T_i**
Data unit:	ºC
Description:	Temperature of inlet chilled water to VACs (A, B and F)
Source of data used:	VAC log sheet
Value applied:	VAC A: 10.7 VAC B: 10.4 VAC F: 10.2
Justification of the choice of data or description of measurement methods and procedures actually applied :	Temperature of inlet chilled water is measure with the online temperature sensor. The accuracy of temperature censor is ±1.5%. This parameter is used to calculate the specific steam consumption of VAC.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	**T_o**
Data unit:	ºC
Description:	Temperature of Outlet chilled water to VACs (A, B and F)
Source of data used:	VAC log sheet

Value applied:	VAC A: 7.5 VAC B: 7.5 VAC F: 7.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	Temperature of inlet chilled water is measure with the online temperature sensor. The accuracy of temperature censor is ±1.5%. This parameter is used to calculate the specific steam consumption of VAC.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	**M**
Data unit:	Kg/hr
Description:	Chilled water Flow rate to VACs (A, B and F)
Source of data used:	VAC log sheet
Value applied:	VAC A: 2472 VAC B:2409 VAC F:2902
Justification of the choice of data or description of measurement methods and procedures actually applied :	Chilled water flow rate from VAC is measured by online flow meter with integrator. The flow meter is of accuracy ±0.075% of calibrated span. This parameter is used to calculate the specific steam consumption of VAC.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	**C_p**
Data unit:	Kcal/kg/°C
Description:	Specific heat of Chilled water
Source of data used:	
Value applied:	1

Justification of the choice of data or description of measurement methods and procedures actually applied :	Specific heat of chilled water is taken from standard database.This parameter is used to calculate the specific steam consumption of VAC.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	**EF_{CO2}**
Data unit:	tCO_2/TJ
Description:	CO_2 Emission factor for fuel used in the boiler (Coal)
Source of data used:	IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	96.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

B.6.3 Ex-ante calculation of emission reductions:

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The emission reduction due to the project activity would be estimated by the following formula:

Baseline emission (BE_y):

Step: 01 Specific Steam Consumption of VACs in Base case

$$SSC_{BL} = \frac{S_{BL}}{\frac{M \times Cp \times (Ti - To)}{3024}}$$

Where:

SSC_{BL} = Baseline Specific Steam Consumption of existing VACs (kg/TR)

S_{BL} = Baseline Steam Consumption of VAC (kg/hr)

M = Mass flow rate of chilled water produced in VAC (kg/hr)

Cp = Specific heat of chilled water (kcal/kg °C)

Ti = Inlet temperature of Chilled water (°C)

To = Outlet temperature of Chilled water (°C)

Specific Steam Consumption (SSC_{BL})	
Baseline Specific Steam Consumption VAC-A	5.07 kg/TR
Baseline Specific Steam Consumption VAC-B	5.25 kg/TR
Baseline Specific Steam Consumption VAC-F	5.17 kg/TR

Step: 02 Baseline total energy input to the VACs (E_{BL})

$$E_{BL} = \frac{(SSC_{BL} \times TR \times S \times WorkingHours \times WorkingDays)}{\eta_{Max}}$$

Where

E_{BL} = Baseline total energy input to the VACs (TJ/yr)

SSC_{BL} = Baseline Specific Steam Consumption of existing VACs (kg/TR)

TR = Rated TR of the existing VACs

S = Net enthalpy of LP steam (kJ/kg)

$$S = S_{tot} - S_{CW}$$

S = Net enthalpy of LP steam consumed in VAC (kJ/kg)

S_{tot} = Enthalpy of LP steam to VAC (kJ/kg)

S_{CW} = Enthalpy of condensate from VAC (kJ/kg)

η_{Max} = Maximum Efficiency of boiler

Baseline total energy input to the VAC (E_{BL})	
Baseline total energy input to the VAC-A	117.8 TJ/yr
Baseline total energy input to the VAC-B	122.1 TJ/yr
Baseline total energy input to the VAC-F	120.2 TJ/yr

Step 03: Baseline Emission (BE_y)

$$BE_y = E_{BL} \times EF_{CO2}$$

Where:

BE_y = Baseline emission (tCO_2/yr)

EF_{CO2} = Emission factor of fuel used in Boiler (tCO_2/TJ)

Baseline Emission VAC (BE_y)	
Baseline Emission from the VAC-A	11323 tCO_2/yr
Baseline Emission from the VAC-B	11730 tCO_2/yr
Baseline Emission from the VAC-F	11548 tCO_2/yr

Project emission (PE_y):

Step: 01 Specific Steam Consumption of VACs in Project case

$$SSC_{PL} = \frac{S_{PL}}{TR_{act}}$$

$$TR_{act} = \frac{M \times Cp \times (Ti - To)}{3024}$$

Where:

SSC_{PL} = Specific Steam Consumption Ratio of new VACs (kg/hr/TR) in project case

S_{PL} = Steam Consumption of VAC (kg/hr) in Project Case

M = Mass flow rate of chilled water produced in VAC (kg/hr)

Cp = Specific heat of chilled water (kcal/kg °C)

Ti = Inlet temperature of Chilled water (°C)

To = Outlet temperature of Chilled water (°C)

Specific Steam Consumption (SSC_{PL})	
Project case Specific Steam Consumption VAC-A	3.90 kg/TR
Project case Specific Steam Consumption VAC-B	3.90 kg/TR
Project case Specific Steam Consumption VAC-F	3.90 kg/TR

Step: 02 Project case total energy input to the VACs (E_{PL})

$$E_{PL} = \frac{(SSC_{PL} \times TR \times S \times WorkingHours \times WorkingDays)}{\eta_{Max}}$$

Where

E_{PL} = Project case total energy input to the VACs (TJ/yr)

SSC_{PL} = Project case Specific Steam Consumption of new VACs (kg/TR)

TR = Rated TR of the new VACs

S = Net enthalpy of LP steam (kJ/kg)

$$S = S_{tot} - S_{CW}$$

S = Net enthalpy of LP steam consumed in VAC (kJ/kg)

S_{tot} = Enthalpy of LP steam to VAC (kJ/kg)

S_{CW} = Enthalpy of condensate from VAC (kJ/kg)

η_{Max} = Maximum Efficiency of boiler

Project case total energy input to the VAC (E_{PL})	
Project case total energy input to the VAC-A	99.9 TJ/yr
Project case total energy input to the VAC-B	99.9 TJ/yr
Project case total energy input to the VAC-F	92.6 TJ/yr

Step 03: Project Emission (PE_y)

$$PE_y = E_{PL} \times EF_{CO2}$$

Where:

PE_y = Project case emission (tCO_2/yr)

EF_{CO2} = Emission factor of fuel used in Boiler (tCO_2/TJ)

Project Emission VAC (PE_y)	
Project emission from VAC-A	9596 tCO_2/yr
Project emission from VAC-B	9596 tCO_2/yr
Project emission from VAC-F	8899 tCO_2/yr

Leakage Emission (LE_y)

$LE_y = 0$

Emission Reduction (ER)

$ER = BE_y - PE_y - LE_y$

Emission Reduction (ER) (tCO_2/yr)				
	Baseline Emission (BE_y)	Project Emission (PE_y)	Leakage Emission (LE_y)	Emission Reduction (ER)
VAC-A	11323	9596	0	1727
VAC-B	11730	9596	0	2134
VAC-F	11548	8899	0	2649
Total	34601	28091	0	6510

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

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Year	Estimation of Project activity emissions (tonnes of CO2e)	Estimation of Baseline emissions (tonnes of CO2e)	Estimation of Leakage (tonnes of CO2e)	Estimation of overall emission reductions (tonnes of CO2e)
2008-2009	34601	28091	0	6510
2009-2010	34601	28091	0	6510
2010-2011	34601	28091	0	6510
2011-2012	34601	28091	0	6510
2012-2013	34601	28091	0	6510
2013-2014	34601	28091	0	6510

2014-2015	34601	28091	0	6510
2015-2016	34601	28091	0	6510
2016-2017	34601	28091	0	6510
2017-2018	34601	28091	0	6510
Total	**346010**	**280910**	**0**	**65100**

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

The approved baseline and monitoring methodology used for the project activity is as follows:

Type II – Energy Efficiency Improvement Project;

Sub Category: D – Energy efficiency and fuel switching measures for industrial facilities

Reference: The monitoring methodology of the project activity is referred from 'Paragraph 9 and 10' of Type II –Energy Efficiency Improvement Project; Sub Category: D – Energy efficiency and fuel switching measures for industrial (Version 11, EB 35)

B.7.1 Data and parameters monitored:

Data / Parameter:	**S_{PL}**
Data unit:	Tonne/day
Description:	Quantity of Steam consumed by VACs (A, B and F)
Source of data to be used:	VAC log sheet
Value of data	-
Description of measurement methods and procedures to be applied:	Steam flow rate will be measured by online steam flow meter with integrator. The flow meter is of accuracy ±0.075 % of calibrated span. This parameter will be used to calculate the specific steam consumption ratio of VAC in project case.
QA/QC procedures to be applied:	The parameter is measured by online flow meter with integrator and logged in VAC log sheet. Based on the logged data a report is prepared by shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments.

	Once the data is compiled and checked, it will be handed over to Verifier (IRSL official) for Verification. After data verification, Auditor (IRSL official) will be informed to carry out the Audit for concerned data. The VAC log sheet document is audited regularly according to ISO procedure. The instruments used for monitoring data are calibrated once in a year.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	**P_{steam}**
Data unit:	Kg/cm^2
Description:	Pressure of inlet Steam to VACs (A, B and F)
Source of data to be used:	VAC log sheet
Value of data	-
Description of measurement methods and procedures to be applied:	Steam pressure will be measured at common header by online pressure gauge. The accuracy of pressure gauge is ±1%. This parameter is used to calculate the enthalpy of steam.
QA/QC procedures to be applied:	The parameter is measured by online pressure gauge and logged in VAC log sheet. Based on the logged data a report is prepared by shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IRSL official) for Verification. After data verification, Auditor (IRSL official) will be informed to carry out the Audit for concerned data. The VAC log sheet document is audited regularly according to ISO procedure. The instruments used for monitoring data are calibrated once in a year.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last

	issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	**T_c**
Data unit:	ºC
Description:	Temperature of condensate from VACs (A, B and F)
Source of data to be used:	VAC log sheet
Value of data	-
Description of measurement methods and procedures to be applied:	Condensate temperature will be measured at condensate collection tank by temperature censor. The accuracy of temperature censor is ±1.5%. This parameter is used to calculate the enthalpy of steam.
QA/QC procedures to be applied:	The parameter is measured by online temperature censor and logged in VAC log sheet. Based on the logged data a report is prepared by shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IRSL official) for Verification. After data verification, Auditor (IRSL official) will be informed to carry out the Audit for concerned data. The VAC log sheet document is audited regularly according to ISO procedure. The instruments used for monitoring data are calibrated once in a year.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	**T_i**
Data unit:	ºC
Description:	Temperature of inlet chilled water to VACs (A, B and F)
Source of data to be used:	VAC log sheet
Value of data	-

Description of measurement methods and procedures to be applied:	Temperature of inlet chilled water will be measure with the online temperature censor. The accuracy of temperature censor is ±1.5%. This parameter is used to calculate the specific steam consumption of VAC.
QA/QC procedures to be applied:	The parameter is measured by online pressure gauge and logged in VAC log sheet. Based on the logged data a report is prepared by shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IRSL official) for Verification. After data verification, Auditor (IRSL official) will be informed to carry out the Audit for concerned data. The VAC log sheet document is audited regularly according to ISO procedure. The instruments used for monitoring data are calibrated once in a year.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	**T_o**
Data unit:	ºC
Description:	Temperature of Outlet chilled water to VACs (A, B and F)
Source of data to be used:	VAC log sheet
Value of data	-
Description of measurement methods and procedures to be applied:	Temperature of inlet chilled water is measure with the online temperature censor. The accuracy of temperature censor is ±1.5%. This parameter is used to calculate the specific steam consumption of VAC.
QA/QC procedures to be applied:	The parameter is measured by online pressure gauge and logged in VAC log sheet. Based on the logged data a report is prepared by shift in charge in soft

	copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IRSL official) for Verification. After data verification, Auditor (IRSL official) will be informed to carry out the Audit for concerned data. The VAC log sheet document is audited regularly according to ISO procedure. The instruments used for monitoring data are calibrated once in a year.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	**M**
Data unit:	Kg/hr
Description:	Chilled water Flow rate to VACs (A, B and F)
Source of data to be used:	VAC log sheet
Value of data	-
Description of measurement methods and procedures to be applied:	Chilled water flow rate from VAC is measured by online flow meter with integrator. The flow meter is of accuracy ±0.075 % of calibrated span. This parameter is used to calculate the specific steam consumption ratio of VAC.
QA/QC procedures to be applied:	The parameter is measured by online flow meter and logged in VAC log sheet. Based on the logged data a report is prepared by shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IRSL

	official) for Verification. After data verification, Auditor (IRSL official) will be informed to carry out the Audit for concerned data. The VAC log sheet document is audited regularly according to ISO procedure. The instruments used for monitoring data are calibrated once in a year.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	Steam generation from boilers
Data unit:	Ton/day
Description:	Steam generate by boiler
Source of data to be used:	Boiler Log sheet
Value of data applied for the purpose of calculating expected emission reductions in section B.5	134.84Ton/day
Description of measurement methods and procedures to be applied:	Steam flow rate is measured though online monitoring system. Steam generated by boiler is measured using the flow meter with accuracy of ±0.075 % of calibrated span. This parameter is used to calculate the efficiency of boiler.
QA/QC procedures to be applied:	The parameter is monitored and logged in boiler log sheets. Based on the logged data and a report consisting of the parameter is prepared by Shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IRSL official) for Verification. After data verification, Auditor (IRSL official) will be informed to carry out the Audit for concerned data. The instruments used for monitoring data are calibrated once in a year.

Any comment:	The data would be archived until 2 years after end of the crediting period or the last issuance of CERs for this project activity, which ever occurs later.

Data / Parameter:	Steam Pressure
Data unit:	$Kg/cm^2(g)$
Description:	Pressure of steam
Source of data to be used:	Boiler Log sheet
Value of data applied for the purpose of calculating expected emission reductions in section B.5	$80kg/cm^2$
Description of measurement methods and procedures to be applied:	Steam Pressure is measured in the plant premises, using pressure gauge with accuracy of ± 1%. This parameter is used to calculate the efficiency of boiler.
QA/QC procedures to be applied:	The parameter is monitored and logged in log sheets. Based on the logged data and a report consisting of the parameter is prepared by Shift in charge in soft copy and are forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IRSL official) for Verification. After data verification, Auditor (IRSL official) will be informed to carry out the Audit for concerned data. The instruments used for monitoring data are calibrated once in a year.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	Steam Temperature
Data unit:	°C
Description:	Temperature of low pressure steam
Source of data to be used:	Boiler Log sheet
Value of data applied	300°C

for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Steam Temperature is measured in the plant premises by using temperature sensor, with accuracy of ± 1.5%.This parameter is used to calculate the efficiency of boiler.
QA/QC procedures to be applied:	The parameter is monitored and logged in log sheets. Based on the logged data and a report consisting of the parameter are prepared by Shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IRSL official) for Verification. After data verification, Auditor (IRSL official) will be informed to carry out the Audit for concerned data. The instruments used for monitoring data are calibrated once in a year.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	Boiler Feed Water Temperature
Data unit:	°C
Description:	Boiler Feed Water Temperature
Source of data to be used:	Log sheet
Value of data applied for the purpose of calculating expected emission reductions in section B.5	40°C
Description of measurement methods and procedures to be applied:	Boiler feed water temperature is measured in the plant premises by using temperature sensor with accuracy of ±1.5%.This parameter is used to calculate the efficiency of boiler.

QA/QC procedures to be applied:	The parameter is monitored and logged in log sheets. Based on the logged data and a report consisting of the parameter are prepared by Shift in charge in soft copy and are forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IRSL official) for Verification. After data verification, Auditor (IRSL official) will be informed to carry out the Audit for concerned data. The instruments used for monitoring data are calibrated once in a year.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	Quantity of fuel (s) used in the boiler(s)
Data unit:	tonnes/day
Description:	Quantity of fuels used in the boiler (Natural gas/ Naphtha)
Source of data to be used:	Boiler log sheet
Value of data applied for the purpose of calculating expected emission reductions in section B.5	21.03 ton/day
Description of measurement methods and procedures to be applied:	Measured in plant premises by number of bunkers charged and bunker volume. This parameter is used for boiler efficiency calculations This parameter is used to calculate the efficiency of boiler.
QA/QC procedures to be applied:	The parameter is monitored and logged boiler log sheet. Based on the logged data and a report consisting of the parameter is prepared by shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments.

	Once the data is compiled and checked, it will be handed over to Verifier (IRSL official) for Verification. After data verification, Auditor (IRSL official) will be informed to carry out the Audit for concerned data.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	NCV of Fuel
Data unit:	Kcal/kg
Description:	Net calorific value of fuel used in boiler
Source of data to be used:	Laboratory record
Value of data applied for the purpose of calculating expected emission reductions in section B.5	19.98 TJ/Ton Fuel tested for each delivery by supplier or in-house or external reliable laboratory.
Description of measurement methods and procedures to be applied:	Net calorific value of fuel used in boiler is determined by fuel testing for each delivery by supplier or in-house or external reliable laboratory.
QA/QC procedures to be applied:	Net calorific value of fuel used in boiler is determined and recorded in laboratory record. Based on the logged data and a report consisting of the parameter is prepared by Shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IRSL official) for Verification. After data verification, Auditor (IRSL official) will be informed to carry out the Audit for concerned data.

Data / Parameter:	Boiler Efficiency
Data unit:	%
Description:	Efficiency of boiler

Source of data to be used:	Calculated
Value of data applied for the purpose of calculating expected emission reductions in section B.5	84.92%
Description of measurement methods and procedures to be applied:	Boiler efficiency calculated monthly, direct method (based on heat balance) is used for the efficiency calculation.
QA/QC procedures to be applied:	This parameter is calculated and logged in log sheets. Based on the logged data and a report consisting of the parameter is prepared by Shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IRSL official) for Verification. After data verification, Auditor (IRSL official) will be informed to carry out the Audit for concerned data.

B.7.2 Description of the monitoring plan:

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As per the paragraph 12 of Simplified Modalities and Procedures for Small Scale CDM Project activities, a proposed project activity shall,

(a) Meet the eligibility criteria for small-scale CDM project activities set out in paragraph 6 (c) of decision 17/CP.7;
(b) Conform to one of the project categories in appendix B to this annex;
(c) Not be a de-bundled component of a larger project activity, as determined through appendix C to this annex.

As per the small scale methodology, project activity falls under the Type-II Energy Efficiency Improvement Project, Subcategory: D. Energy efficiency and fuel switching measures for industrial facilities, the monitoring methodology and plan has been developed in line with the guidance provided in paragraph 9, 10 of category II.D of Appendix B.

9. In the case of replacement, modification and retrofit measures the monitoring shall consist of:

(a) Documenting the specifications of the equipment replaced;

(b) Metering the energy use of the industrial or mining and mineral production facility, processes or the equipment affected by the project activity;

(c) Calculating the energy savings using the metered energy obtained from subparagraph (b).

10. In the case of a new facility, monitoring shall consist of:

(a) Metering the energy use of the equipment installed;

(b) Calculating the energy savings due to the equipment installed.

Since the project is energy efficiency project, the emission reductions of the project activity depends on the amount of energy saved. The project activity replaces three numbers of existing lower efficient VACs by higher energy efficient VACs and thereby reduction of specific steam consumption per TR and subsequent reduction of fuel consumption in Boiler.

Monitoring of GHG emission reductions due to project activity will be based on the steam saving due to project activity. The steam consumption (energy use) of VACs (equipments) is monitored before and after implementation of the project activity. As well as, parameters (like Chilled water flow, Temperature of

chilled water at inlet and outlet of chiller etc.,) required to calculate chiller tonnage (TR) of VACs is also monitored before and after implementation of the project activity. There is no project emissions envisaged from the project activity. The monitoring plan is formulated to monitor the energy use of the equipment affected by the project activity. The metered parameters would be used to calculate energy savings and thereby emission reductions.

The monitoring process for this project is as follows:

1. Quantity of steam consumed in VAC - A, B and F
2. Pressure of inlet steam to VAC- A, B and F
3. Temperature of condensate from VAC- A, B and F
4. Chilled water flow to VAC - A, B and F
5. Temperature of inlet chilled water to VACs (A,B and F)
6. Temperature of outlet chilled water from VACs (A,B and F)
7. Steam generation by the boiler
8. Temperature of the steam generated from the boiler
9. Pressure of the steam generated from the boiler
10. Boiler feed water temperature
11. Fuel consumption in the boiler
12. Net Calorific Value (NCV) of fuel
13. Boiler efficiency (Calculated)

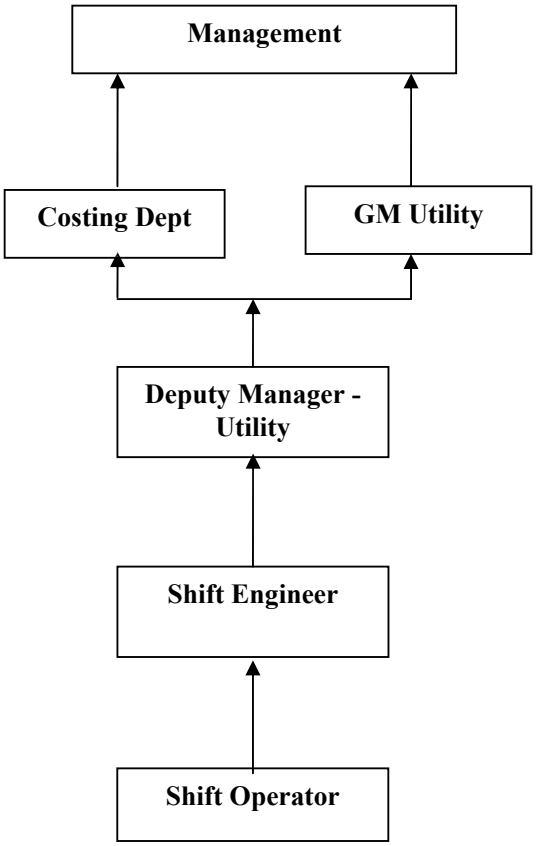
The above parameters are monitored by the operator according to procedure prescribed in ISO manual. The parameters (mentioned above table) are monitored and logged in log sheet. Based on the logged data, a report consisting of above parameters is prepared by Shift in charge in soft copy and is forwarded to CDM Coordinator through emails/hard copy on monthly basis. The report received from the respective department through e-mail/hard copy is compiled by Coordinator CDM. The reports will be retained till 2 years after the end of crediting period.

To ascertain the Quality Control and Quality Assurance of the monitored parameters following procedure is adopted:

- The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IRSL official) for Verification. After data verification, Auditor (IRSL official) will be informed to carry out the Audit for concerned data.

- The instruments used for monitoring data are calibrated once in a year and slandered calibration procedure used for calibration.

The operational and management structure that the project participant will implement in order to monitor emission reductions and any leakage effects generated by the project activity is given below:



A CDM manual is prepared to illustrate the roles and responsibilities of individuals involved in project activity. CDM Manual clearly defines the roles, responsibilities and guidelines for different chores of project activity and procedures for monitoring of various parameters and the department / persons responsible for the data collection, data storage and protection, procedure for calibration of instruments and measurement equipments etc.

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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The baseline and monitoring for the proposed project activity has been estimated by using the small scale methodology II. D.

Date of completion of the baseline: 04/04/2008

Name of person/entity determining the baseline and monitoring methodology:

Mr. Vivek Kaul

M/s Indo Rama Synthetics (India) Limited

Dr. Gopal Das Bhawan, 4th Floor

28, Barakhamba Road,

New Delhi-110001

The detail of the project participant is enclosed in Annex 1 of this 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:

>>
19/03/2004

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

>>

15 year - 0 month

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

The project activity would use 10 years fixed crediting period.

C.2.1. Renewable crediting period

Not Applicable

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

>>
Not Applicable

C.2.1.2. Length of the first crediting period:

>>
Not Applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
20/07/2008 or the date of registration, which ever occurs later.

C.2.2.2. Length:

>>
10 year 0 month

SECTION D. Environmental impacts

>>

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 does not fall under the purview of the Environmental Impact Assessment (EIA) notification[4] S.O. 60 (E) of the Ministry of Environment and Forest, Government of India.

There would not be any significant negative impact over the environment due to the project activity. The major benefits of the project activity towards environment The project activity would result in reduction of GHG emissions leading to environment benign.

Indo Rama has in place ISO-9001 (2000) for highest standard of Quality Management System (QMS), ISO-14001 (2004) for Environment Management System (EMS) and OEKO Tex certificate to meet Human Ecological requirements. Implementation of OSHAS-18001 (Occupational Safety and Health) and Social Accountability (SA8000) is being taken up in the year 2006-07. As well as IRSL regularly submits environmental statement to the Pollution Control Board (PCB) and has consent to operate plant.

IRSL project activity leads to fossil fuel conservation and GHG emission reduction and has positive impacts on environment- air, land, water.

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 results in simultaneous benefits of conservation of fuel, achieving energy efficiency of the plant and there is no negative environmental impact due to project activity.

[4] Reference : http://envfor.nic.in/legis/eia/so-60(e).html

SECTION E. Stakeholders' comments

>>

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

>>

The project activity of IRSL aims to reduce the Specific Steam Consumption Ratio of Vapour Absorption Chillers (VAC). The project activity results in reduction of fuel consumption in coal based boilers leading to energy efficiency and respective GHG emission reduction. The project activity has no environmental or social negative impact.

Stakeholder Identification:

The project activity is a small scale project activity so the stakeholders are identified on the basis of their involvement at various stages of project activity. The local stakeholders identified for in-house energy efficiency projects are mainly management representatives and employees of the IRSL. The project proponent consulted employees of the IRSL by briefing them about the project activity during internal environment meeting.

The stakeholders identified for the project are:

- Employees of IRSL
- Ministry of Environment & Forest (MoEF), Government of India
- Maharashtra Pollution Control Board (MPCB)

A meeting was conveyed by IRSL, which was attended by the employees from various departments (like-utility, civil, production-POY, SPG, PSF, lab, safety etc). During the meeting various activities and initiatives taken by IRSL in the field of energy efficiency and environment benefit was explained. The project activity and its associated benefits were discussed in the meeting. Employees of IRSL responded positively about the project activity and there were no major comment/concern raised during the consultation meeting.

E.2. Summary of the comments received:

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The employees of IRSL expressed their support on understanding the various benefits of project activity. They appreciated that the project activity would not only results reduction of steam demand and thereby coal but also minimize the harmful effects due to loss of LiBr. There were no major comments/concerns raised by the employees.

Ministry of Environment & Forests (MoEF) would be providing the host country approval for the project activity.

IRSL regularly submits the environmental statement to MPCB and has consent to operate the plant.

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

>>

There are no comments or concerns raised during the consultation with stakeholders. Further, as required by the CDM cycle, the PDD would be published at the DOE`s web site for public comments.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding as part of project financing from parties included in Annex I of the convention is involved in the project activity.

Annex 3

BASELINE INFORMATION

As per Section B.4 of the PDD. For detailed baseline calculation, please refer emission reduction calculation sheet.

Annex 4

MONITORING INFORMATION

As Per Section B.7.2 of the PDD

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