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

CONTENTS

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.

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

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

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

Version: 02

Date: 16/04/2007

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, India. IRSL fibre complex has the manufacturing facility to manufacture Polyester Chips, Partially Oriented Yarn (POY), Polyester Staple Fibre (PSF) and Draw Twisted Yarn (DTY).

IRSL requires chilled water to meet the process air conditioning requirements of POY, PSF and DTY section. The chilled water requirement of IRSL is catered by operating Vapour Absorption Chillers (VACs). IRSL being a progressive organisation, continuously explores various possibilities for energy conservation and improvement in environmental performance.

Purpose of the Project Activity

The purpose of IRSL project activity is to reduce GHG emissions by improving energy efficiency of VACs. IRSL operates 8 numbers of VACs of 1125 TR each to cater the chilled water requirement in the fibre complex and the specific steam consumption of existing VACs is in the range of 5.0 to 5.4 kg/TR/hr.

IRSL project activity involves replacement of 3 numbers of existing lower energy efficient VACs with higher energy efficient VACs (2 x 1240 TR and 1 x 1150 TR) in phased manner. The replacement of lower energy efficient VACs with higher energy efficient VACs will reduce the specific steam consumption of VACs and over all steam demand and thereby reducing the fossil fuel consumption in boiler.

The specific steam consumption of new energy efficient VACs are 3.9 kg/TR/hr which is very less with comparison of existing lower efficient VACs i.e. 5.0 to 5.4 kg/TR/hr.

Out of three VACs, two numbers of VACs were commissioned in July 2004 and August 2004. Third VAC is scheduled to be commissioned in February 2007.

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:

*1. **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.

*2. **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.

*3. **Technological well being:***

The project activity involves implementation of a new energy efficient VACs of 1240 TR and 1150 TR. 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:

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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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Butibori, Distt- Nagpur.

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

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The project activity is located at Indo Rama Synthetics (India) Limited (IRSL), Butibori Distt- Nagpur, Maharashtra, India. The synthetic fibre complex of IRSL is situated a MIDC Butibori, about 25 km from the city of 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 of the small-scale project activity:

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Type and Category of Project Activity

The IRSL project meets the applicability criteria of the small-scale CDM project activity category, Type - II: Energy Efficiency Improvement Projects (D: Energy efficiency and fuel switching measures for industrial facilities) 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: 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 08), Type II D "comprises any energy efficiency and fuel switching measure implemented at a single industrial 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 3 and 4 of II D of appendix B (version 08) and the monitoring methodology would be based on guidance provided in paragraphs 6 and 7 of II D of the same appendix B.

The project activity meets the eligibility criteria since the maximum saving in energy input is 17.46 $GWh_{th;}$ 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
Capacity	: 1240 TR
Specific Steam Consumption	: 3.9 kg/TR/hr
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/TR/hr(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

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

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The IRSL project activity aims to reduce the Specific Steam Consumption Ratio of VACs and thereby reducing the steam demand and subsequently reducing fossil fuel consumption and leading to GHG emission reduction. The steam consumed in VACs is generated in coal fired LP FBC boilers (2 x 10 TPH). Any reduction in steam consumption of VACs, would result in reduction in fossil fuel (coal) consumption in boiler and subsequently CO_2 emission reduction.

In absence of the project activity, the lower efficient VACs would have continued to operate, leading to higher steam consumption in VACs and consequently higher GHG emissions. Hence, the project activity

results in reduction of anthropogenic emissions which would not occur in the absence of the project activity.

The project activity leads to GHG emission reductions of around **59080** tonnes of CO_2e over a 10 year crediting period.

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

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Years	Annual Estimation of emission reduction in tonnes of CO_2e
2007-2008	5908
2008-2009	5908
2009-2010	5908
2010-2011	5908
2011-2012	5908
2012-2013	5908
2013-2014	5908
2014-2015	5908
2015-2016	5908
2016-2017	5908
Total estimated reductions (tonnes of CO_2e)	59080
Total number of crediting years	**10 years**
Annual Average over the crediting period of estimated reduction (tonnes of CO_2e)	5908

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

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

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

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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 for energy efficiency improvement in thermosetting process is entirely different..

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 methodology:

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

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The project activity satisfies the eligibility criteria to adopt 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: D – Energy efficiency and fuel switching measures for industrial (Version 08, 23 December 2006)

Reference: UNFCCC CDM website

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

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The project activity falls under **Type II –Energy Efficiency Improvement Project; Sub Category: D – Energy efficiency and fuel switching measures for industrial facilities.** According to AMS II.D methodology (version 8, 23 December 2006) the category comprises any energy efficiency and fuel switching measure implemented at a single industrial facility. This category covers project activities aimed primarily at energy efficiency; a project activity that involves primarily fuel switching falls into category III.B. 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 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.

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

1. The project activity is installed in single industrial facility i.e. IRSL, Butibori plant

2. The project activity is to replace existing lower energy efficient VACs with higher energy efficient VACs leading to energy efficiency.

3. The aggregate energy savings from the project is 17.01 GWh_{th} which is less than 180 GWh_{th} per year in fuel input.

As the project activity replaces existing lower efficient VACs with higher energy efficient VACs, thus the project activity is applicable to project category.

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

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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. IRSL along with equipment supplier carried out R&D and

customized the design of new technology based VACs (higher efficient VACs) to cater the specific requirement of IRSL.

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 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 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

The new VACs use Lithium bromide (LiBr) as corrosion inhibitor. The usage of LiBr 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.

- LiBr is a toxic substance 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 condensate (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 vapor 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.

As elaborated above, IRSL would face huge technical barriers and operational risk by implementing the project activity. The CDM revenue from the project activity would help IRSL in mitigating or covering up the technological/operational risks of the project.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the small-scale project activity:

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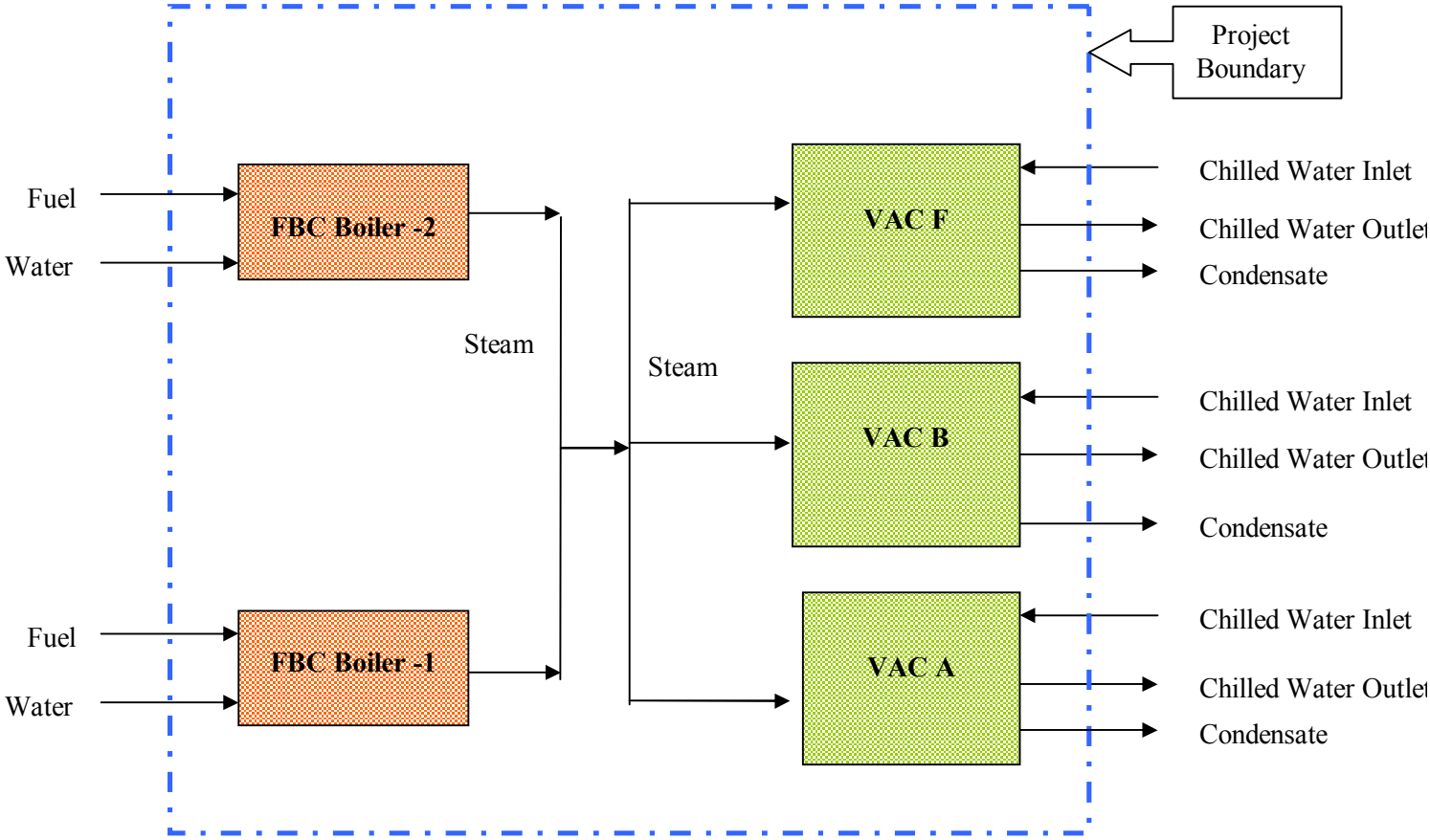
As per the guidelines provided in the approved methodology, project boundary encompasses the physical and geographical site of the industrial facility, processes or equipments that are affected by the project activity.



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

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The baseline for the proposed project activity has been estimated by using the methodology specified in the applicable project category for small-scale CDM project activities. The details are given in section E 1.2.4 and E 1.2.5.

Date of completion of the baseline: 12/07/2006

Name of person/entity determining the baseline: M/s Indo Rama Synthetics (India) Limited

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 small-scale project activity:

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C.1.1. Starting date of the small-scale project activity:

>>
21/06/2004

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

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15 year - 0 month

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

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The project activity would use fixed ten years crediting period.

C.2.1. Renewable crediting period:

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Not applicable

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

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Not applicable

C.2.1.2. Length of the first crediting period:

>>

Not applicable

C.2.2. Fixed crediting period:

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C.2.2.1. Starting date:

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01/05/2007 or the date of registration, which ever occurs later.

C.2.2.2. Length:

>>
10 year 0 month

SECTION D. Application of a monitoring methodology and plan:

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D.1. Name and reference of approved monitoring methodology applied to the small-scale project activity:

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The approved monitoring methodology of 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 6 and 7' of Type II –Energy Efficiency Improvement Project; Sub Category: D – Energy efficiency and fuel switching measures for industrial (Version 8, 23 December 2006)

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

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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 6, 7 of category II.D of Appendix B.

6. 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 facility, processes or the equipment affected by the project activity;

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

7. 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)

There is no technology transfer in the project activity and therefore, the project activity would not lead to any leakage emissions. The baseline emissions would be the emission reductions from the project activity.

D.3 Data to be monitored:

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ID No.	Data Variable	Data Source	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic / paper)	For how long is archived data to be kept?	Comment
1	Quantity of Steam consumed in VACs (A, B and F)	VAC Log Book	kg/day	M	Daily	Total	Electronic/ Paper	The data would be archived until 2 years after end of the crediting period or the last issuance of CERs for this project activity	Measured in the plant premises by using flow meter. This parameter is used for calculations of specific steam consumption per TR.
2	Pressure of inlet Steam to VACs (A, B and F)	VAC Log Book	Kg/cm^2	M	Daily	Total	Electronic/ Paper	The data would be archived until 2 years after end of the crediting period or the last issuance of CERs for this project activity	Measured in the plant premises by using pressure gauge. This parameter is used to estimate the enthalpy of inlet steam.
3	Temperature of condensate from VACs (A, B and F)	VAC Log Book	°C	M	Daily	Total	Electronic/ Paper	The data would be archived until 2 years after end of the crediting period or the last issuance of CERs for this project activity	Measured in the plant premises by using temperature sensor. This parameter is used to estimate the net enthalpy of inlet steam.

4	Chilled water Flow rate to VACs (A, B and F)	VAC Log Book	M^3/hr	M	Daily	Total	Electronic/ Paper	The data would be archived until 2 years after end of the crediting period or the last issuance of CERs for this project activity	Measured in the plant premises by using flow meter. This parameter is used for TR calculations.
5	Temperature of inlet chilled water to VACs (A, B and F)	VAC Log Book	^{0}C	M	Daily	Total	Electronic/ Paper	The data would be archived until 2 years after end of the crediting period or the last issuance of CERs for this project activity	Measured in the plant premises by using temperature sensor. This parameter is used for TR calculations.
6	Temperature of Outlet chilled water to VACs (A, B and F)	VAC Log Book	^{0}C	M	Daily	Total	Electronic/ Paper	The data would be archived until 2 years after end of the crediting period or the last issuance of CERs for this project activity	Measured in the plant premises by using temperature sensor .This parameter is used for TR calculations.
7	Fuel consumption	Utility Log Book	Ton / day	m	Once in a day	Total	Electronic/ Paper	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.	Measured in plant premises by number of bunkers charged and bunker volume. This parameter is used for boiler efficiency calculations.

8	Steam generation from boilers	Utility Log Book	Ton/day	m	Daily	Total	Electronic/ Paper	The data would be archived until 2 years after end of the crediting period or the last issuance of CERs for this project activity	Measured in the plant premises by using flow meter. This parameter is used to calculate the boiler efficiency.
9	Steam Pressure from boiler	Utility Log Book	Kg/cm^2	m	Daily	Total	Electronic/ Paper	The data would be archived until 2 years after end of the crediting period or the last issuance of CERs for this project activity	Measured in the plant premises by using pressure gauge. This parameter is used to calculate the efficiency of boiler.
10	Steam Temperature from boiler	Utility Log Book	^oC	m	Daily	Total	Electronic/ Paper	The data would be archived until 2 years after end of the crediting period or the last issuance of CERs for this project activity	Measured in the plant premises by using temperature sensor. This parameter is used to calculate the efficiency of boiler.
11	Boiler feed water temperature	Utility Log Book	^oC	m	Daily	Total	Electronic/ Paper	The data would be archived until 2 years after end of the crediting period or the last issuance of CERs for this project activity	Measured in the plant premises by using temperature sensor. This parameter is used to calculate the efficiency of boiler.

12	Net Calorific Value of fuel	Lab report	kJ/kg	m	Shipment basis	Actual Sample Testing	Electronic/ Paper	The data would be archived until 2 years after end of the crediting period or the last issuance of CERs for this project activity	Fuel tested for each delivery by supplier or in-house or external reliable laboratory.
13	Boiler Efficiency	Calculated	%	e	Monthly	100%	Electronic/ Paper	The data would be archived until 2 years after end of the crediting period or the last issuance of CERs for this project activity	Direct efficiency based on heat balance.

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

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Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored. The details are as follows:

Data	**Uncertainty level of data (High/Medium/Low)**	**Are QA/QC procedures planned for these data?**
D.3.1	Low	Yes, it is planned as per ISO 9000 procedure
D.3.2	Low	Yes, it is planned as per ISO 9000 procedure
D.3.3	Low	Yes, it is planned as per ISO 9000 procedure
D.3.5	Low	Yes, it is planned as per ISO 9000 procedure
D.3.6	Low	Yes, it is planned as per ISO 9000 procedure
D.3.7	Low	Yes, it is planned as per ISO 9000 procedure
D.3.8	Low	Yes, it is planned as per ISO 9000 procedure
D.3.9	Low	Yes, it is planned as per ISO 9000 procedure
D.3.10	Low	Yes, it is planned as per ISO 9000 procedure

Data	Uncertainty level of data (High/Medium/Low)	Are QA/QC procedures planned for these data?
D.3.11	Low	Yes, it is planned as per ISO 9000 procedure
D.3.12	Low	Yes, it is planned as per ISO 9000 procedure
D.3.13	Low	Yes, it is planned as per ISO 9000 procedure

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.

D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:

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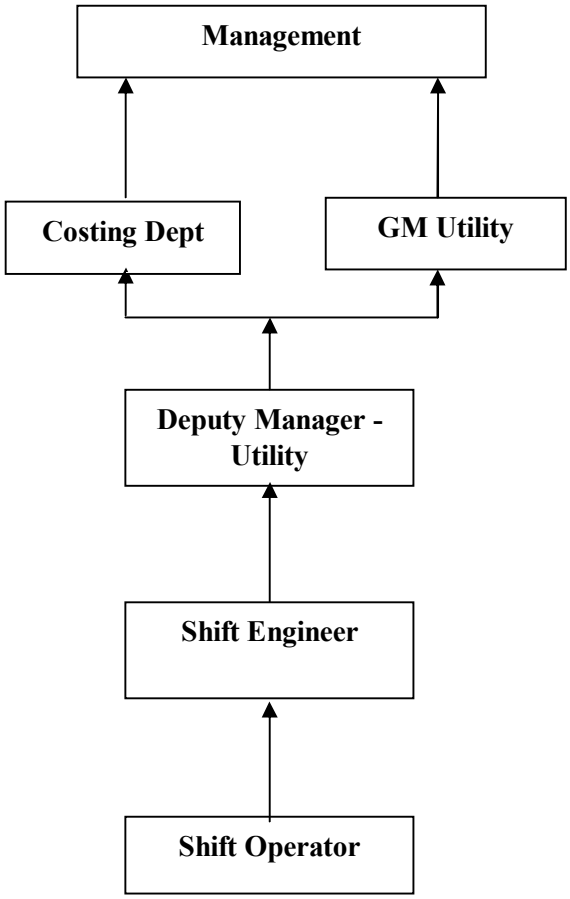

A CDM manual is prepared to illustrate the roles and responsibilities of individuals involved in project activity. CDM Manual clearly defines the roles, responsibilities and guidelines for different chores of project activity and procedures for monitoring of various parameters and the department / persons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

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

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Mr. Abhinandan Chattarjee

M/s Indo Rama Synthetics (India) Limited, Buti bori, Nagpur

The project participant details are given in Annex 1 of this document.

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

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E.1.1 Selected formulae as provided in appendix B:

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The formula for estimation of GHG emission reduction is not mentioned in 'Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories Type II - Category D.

E.1.2 Description of formulae when not provided in appendix B:

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E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

>>

No emission is envisaged due to project activity

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

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As per paragraph 5 of Indicative simplified baseline and monitoring methodology for selected small-scale CDM project activity -Type II - Category D. It has been specified that "*If the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered*".

In the proposed project activity, the equipments are newly procured and are not transferred from another activity and the three existing VACs would be scrapped. Hence the leakages due to project activity need not to be consider.

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

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Nil

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities:

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The approach adopted for calculating emission reduction due to implementation of project activity is explained below:

The project activity replaces the existing lower efficient VACs with the higher energy efficient VACs, thus reducing the Specific Steam Consumption Ratio (SSCR) of Vapour Absorption Chillers.

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

Step 01: The reduction in specific steam consumption of VACs is calculated as difference between specific steam consumption ratio of base case and specific steam consumption ratio of project case.

Step 02: By multiplying the reduction in specific steam consumption of VACs and TR generated, reduction in LP steam consumption of VACs due to project activity shall be calculated.

Step 03: Subsequently the reduction in emission due to the project activity shall be calculated by estimating reduction in input energy to the boiler which would have been required for the equivalent quantity of additional LP steam generated in absence of the project activity (LP steam saved due to project activity) and emission factor of fuel used in the boiler(coal).
The reduction in input energy to the boiler is calculated from quantity of LP steam saved, net enthalpy of steam and efficiency of boiler.

The parameters are monitored from 1st August 2003 to 31st July 2004 to estimate the baseline specific steam consumption ratio. The one year data is used for baseline fixation, since it considers all seasonal variations (summer and winter season).

The specific steam consumption ratio of new VAC guaranteed by the equipment supplier is used as project SSCR for emission reduction estimation.

Baseline Parameter	Value	Source of Data/Data Basis
VAC-A		
SSCR of VAC-A (Base Case)	5.1 kg/hr/TR	Averaged out from daily SSCR values of VAC-A during the period 1st August 2003 to 31st July 2004.

Daily SSCR of VAC-A (Base Case)	-	Daily SSCR value is calculated from daily value of steam consumed in VAC-A and TR generated by VAC-A
Daily steam consumption by VAC-A	-	This parameter is measured on daily basis by online steam flow meter.
Daily TR generation by VAC-A	-	This parameter is calculated from chilled water flow rate of VAC-A (chilled water flow is measured by online flow meter) and chilled water temperature measured at inlet and outlet of VAC-A.
VAC-B		
SSCR of VAC-B (Base Case)	5.25 kg/hr/TR	Averaged out from daily SSCR values of VAC-B during the period 1st August 2003 to 31st July 2004.
Daily SSCR of VAC-B (Base Case)	-	Daily SSCR value is calculated from daily value of steam consumed in VAC-B and TR generated by VAC-B
Daily steam consumption by VAC-B	-	This parameter is measured on daily basis by steam flow meter with integrator
Daily TR generation by VAC-B	-	This parameter is calculated from chilled water flow rate of VAC-B (chilled water flow is measured by online flow meter) and chilled water temperature measured at inlet and outlet of VAC-B
VAC-F		
SSCR of VAC-F (Base Case)	5.17 kg/hr/TR	Averaged out from daily SSCR values of VAC-A during the period 1st August 2003 to 31st July 2004.
Daily SSCR of VAC-F (Base Case)	-	Daily SSCR value is calculated from daily value of steam consumed in VAC-F and TR generated by VAC-F
Daily steam consumption by VAC-F	-	This parameter is measured on daily basis by steam flow meter

		with integrator
Daily TR generation by VAC-F	-	This parameter is calculated from chilled water flow rate of VAC-F (chilled water flow is measured by online flow meter) and chilled water temperature measured at inlet and outlet of VAC-F.

Project Activity Parameter	Value	Source of Data/Data Basis
SSCR of VAC-A(Project Case)	3.9 kg/hr/TR	This parameter is guaranteed by the equipment supplier, Same value is used for the CER calculation. However this parameter will be calculated on the basis of measured value of Steam consumption by VAC-A, Chilled water flow rate of VAC-A and chilled water inlet and outlet temperature from VAC-A, during the verification of the project activity.
SSCR of VAC-B(Project Case)	3.9 kg/hr/TR	This parameter is guaranteed by the equipment supplier, Same value is used for the CER calculation. However this parameter will be calculated on the basis of measured value of Steam consumption by VAC-B, Chilled water flow rate of VAC-B and chilled water inlet and outlet temperature from VAC-B, during the verification of the project activity.

SSCR of VAC-F(Project Case)	3.9 kg/hr/TR	This parameter is guaranteed by the equipment supplier, Same value is used for the CER calculation. However this parameter will be calculated on the basis of measured value of Steam consumption by VAC-F, Chilled water flow rate of VAC-F and chilled water inlet and outlet temperature from VAC-F, during the verification of the project activity.

Specific Steam Consumption of VACs in Base case:

$$SSCR_{Base\,case} = \frac{S_{Base\,case}}{\frac{M \times Cp \times (Ti - To)}{3024}}$$

$SSCR_{Base\,case}$ = Baseline Specific Steam Consumption Ratio (SSCR) of VACs (kg/hr/TR)

$S_{Base\,case}$ = 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)

Baseline Specific Steam Consumption Ratio (SSCR) of VAC A = 5.1 kg/hr/TR

Baseline Specific Steam Consumption Ratio (SSCR) of VAC B = 5.3 kg/hr/TR

Baseline Specific Steam Consumption Ratio (SSCR) of VAC F = 5.2 kg/hr/TR

Specific Steam Consumption of VACs in Project Case:

$$SSCR_{Project\,Case} = \frac{S_{Project\,case}}{\frac{M \times Cp \times (Ti - To)}{3024}}$$

$SSCR_{Project\,case}$ = Specific Steam Consumption Ratio (SSCR) of VACs (kg/hr/TR) in project case

$S_{Project\,case}$ = 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 Ratio (SSCR) of VAC –A in project case = 3.9 kg/hr/TR

Specific Steam Consumption Ratio (SSCR) of VAC –B in project case = 3.9 kg/hr/TR

Specific Steam Consumption Ratio (SSCR) of VAC –F in project case = 3.9 kg/hr/TR

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

>>

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

Step: 01 Estimate the difference in SSCR of base case and project scenarios ($SSCR_{diff}$)

$$SSCR_{diff} = SSCR_{Base case} - SSCR_{Project Case}$$

Where

$SSCR_{diff}$ = Difference in SSCR of VACs in baseline and project scenario

$SSCR_{Base case}$ = Specific Steam Consumption Ratio of VACs in the base case

$SSCR_{Project case}$ = Specific Steam Consumption Ratio of VACs in project case

Difference in SSCR of VAC-A in baseline and project scenario ($SSCR_{A-diff}$) =1.2 kg/hr/TR

Difference in SSCR of VAC-B in baseline and project scenario ($SSCR_{B-diff}$) = 1.4 kg/hr/TR

Difference in SSCR of VAC-F in baseline and project scenario ($SSCR_{F-diff}$) = 1.3 kg/hr/TR

Step: 02 Estimate net reduction in LP steam consumption[1] (S_{net})

$$S_{net} = SSCR_{diff} \times TR_{act} \times WorkingHours$$

Where

S_{net} = Net reduction in LP steam consumption by VAC per day (Tonnes/day)

$SSCR_{diff}$ = Difference in SSCR of VAC in base case and project case (kg/hr/TR)

TR_{act} = Actual value of TR generated by VAC in project case (TR)

[1] Assumption for the CER calculation: Daily operating hours = 24 Hours and Yearly operating days =180 days/yr (Since VAC will be sporadically operated during winter months)

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

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)

Net reduction in LP steam consumption by VAC –A per day = 34.89 Tonnes/day

Net reduction in LP steam consumption by VAC –B per day = 40.32 Tonnes/day

Net reduction in LP steam consumption by VAC –A per day = 35.14 Tonnes/day

Step: 03 Estimate the net reduction in energy due to reduction in steam consumption (E_{net})

$$E_{net} = S_{net} \times E_s$$

Where

E_{net} = Net reduction in LP steam energy consumption per day (kJ/day)

S_{net} = Net reduction in LP steam consumption per day (Tonnes/day)

E_s = Net enthalpy of LP steam consumed in VACs (kJ/kg)

And

$$E_s = E_{tot} - E_{CW}$$

Where

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

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

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

Reduction in input energy to the boiler (E_{in})

$$E_{in} = (E_{net} / \eta_b) \times WorkingDays$$

Where

E_{in} = Energy input for LP steam reduction in boiler

E_{net} = Net reduction in LP steam energy consumption (kCal)

η_b = Maximum Efficiency of boiler

Total Energy Saving from VAC-A = 19.44 TJ/year

Total Energy Saving from VAC-B = 22.46 TJ/year

Total Energy Saving from VAC-F = 19.58 TJ/year

Estimation of CO_2 emission reduction

$CO_{2e} = E_{in}$ X Emission factor of fuel

CO_2 emission reduction from VAC-A = 1868 tCO_2/yr

CO_2 emission reduction from VAC-B = 2158 tCO_2/yr

CO_2 emission reduction from VAC-F = 1881 tCO_2/yr

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

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Emission Reductions:

Year	Emissions Reduction tCO_2e	Leakage tCO_2e	Annual Emission Reductions tCO_2e
2007-2008	5908	0	5908
2008-2009	5908	0	5908
2009-2010	5908	0	5908
2010-2011	5908	0	5908
2011-2012	5908	0	5908
2012-2013	5908	0	5908
2013-2014	5908	0	5908
2014-2015	5908	0	5908
2015-2016	5908	0	5908
2016-2017	5908	0	5908
Total estimated reductions for 10 years (tonnes of CO_2 e)	5908	**0**	5908

SECTION F.: Environmental impacts:

F.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[2] 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.

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

SECTION G. Stakeholders' comments:

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

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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.

G.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.

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

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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.

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