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

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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:

>>

Implementation of energy conservation measure at Mannur, Kanchipuram district, Tamilnadu, India

Version 01

03/05/2007

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

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The purpose of the project activity is to reduce the Green House Gas (GHG) emissions by recovering the waste heat from DG set exhaust gas and reducing the electricity consumption of chillers.

D-TVS DSL's CDM project activity involves the installation of one Vapour Absorption Machine (VAM) of capacity 375 TR. D-TVS DSL has three nos. of 100 Tons of Refrigeration (TR) and two nos. of 72 TR vapour compression chillers. The project activity will replace the existing two nos. of 100 TR and two nos. of 72 TR vapour compression chillers. The electricity demand of D-TVS DSL is met by power imports from Tamil Nadu Electricity Board (TNEB) and captive Diesel Generator (DG) sets.

Hot water would be produced by recovering waste heat from DG set exhaust gas. Hot water from Heat Recovering Unit (HRU) will act as energy input to VAM which produces chilled water. As a result, electricity consumed in vapour compressor chillers would be saved. And this reflects as reduced TNEB power consumption leading to reduction in green house gas emissions.

Delphi-TVS Diesel Systems Limited (D-TVS DSL) is in the process of implementing energy conservation measure at Mannur plant. D-TVS DSL is a joint venture between Delphi automotive systems, USA and T.V. Sundram Iyengar & Sons, India. It manufactures Injection equipments for cars, multi and sports utility vehicles, light commercial vehicles, tractors, single & two cylinder small engines.

Key indicators for sustainable development are socio-economic, environmental and technological benefits. The contribution of project activity towards sustainable development of India is explained as follows.

1. ***Socio-economic benefits:***

The project activity enhances business opportunities for local stakeholders such as consultants, suppliers, manufacturers, contractors etc during implementation phase. The project activity would raise the short term employment opportunities of the local people during the construction phase. The project activity will save electricity consumption from TNEB grid, because of which it adds value to national economy.

2. ***Environmental benefits:***

The project activity would result in saving of electricity from southern regional grid. This will lead to reduction in GHG emission due to the fossil fuel usage in grid connected power plants. Moreover, VAM is Chloro Fluoro Carbon (CFC) free, which is an eco-friendly technology.

*3. **Technological benefits:***

VAM has no moving parts and hence no noise and vibrations. VAM is efficient during part load performance with automatic controls. VAM operates on waste heat recovered from DG exhaust and hence low utility bills.

A.3. Project participants:

>>

Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India	Delphi TVS Diesel Systems Ltd	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):

>>

India

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

>>

Tamil Nadu

A.4.1.3. City/Town/Community etc:

>>

Mannur

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

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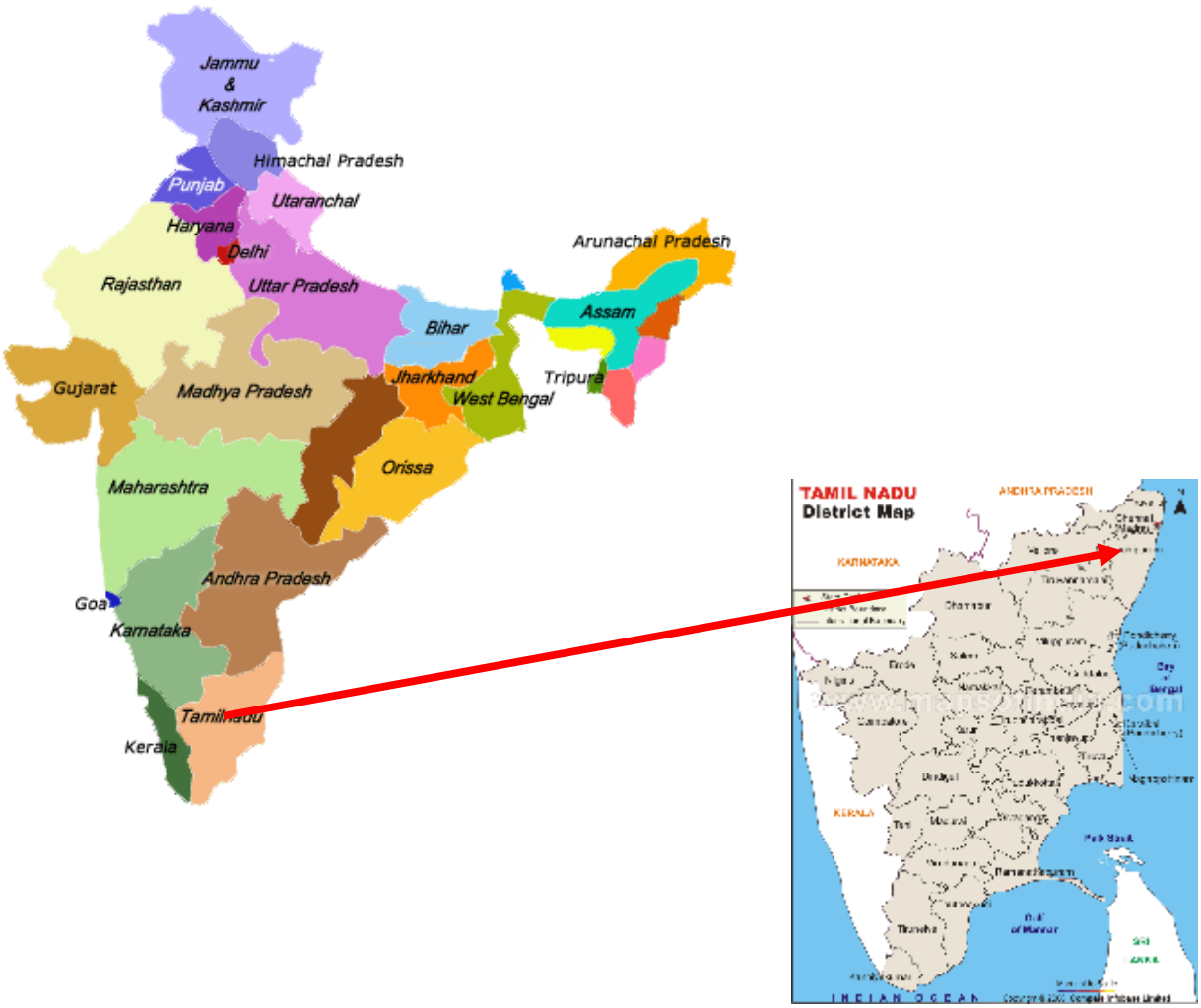
The project activity is located at Mannur Village, Sriperumbudur Taluk, Kancheepuram District, Tamil Nadu (latitude: 13° 1' 26 North, Longitude: 79° 57' 34 East), India. The plant is located at 10 km from Chennai – Bangalore National Highway NH 4. The nearest airport is Chennai airport, which is 30 km from the plant location. The geographical location of the project activity is depicted in the following map:


Jammu & Kashmir
Himachal Pradesh
Punjab
Utaranchal
Haryana
Delhi
Rajasthan
Uttar Pradesh
Arunachal Pradesh
Assam
Bihar
Jharkhand
West Bengal
Tripura
Gujarat
Madhya Pradesh
Orissa
Maharashtra
Andhra Pradesh
Goa
Karnataka
Tamilnadu
Kerala
TAMIL NADU
District Map
KARNATAKA
KERALA
INDIAN OCEAN

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

>>

Type II – Energy Efficiency Improvement projects

Category D - Energy Efficiency and fuel switching measures for industrial facilities.

The approved baseline methodology has been referred from the Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories - version 8 - 23rd December 2006. From this reference, the following category is selected for the project activity:

Technology of the project activity:

The project activity comprises of one Heat Recovery Unit and one Vapour Absorption Machine.

Heat Recovery Unit: It recovers heat from DG set Exhaust gas to generate hot water. Technical specifications of HRU are given below:

Operating Parameters:

a) Gas Side Data

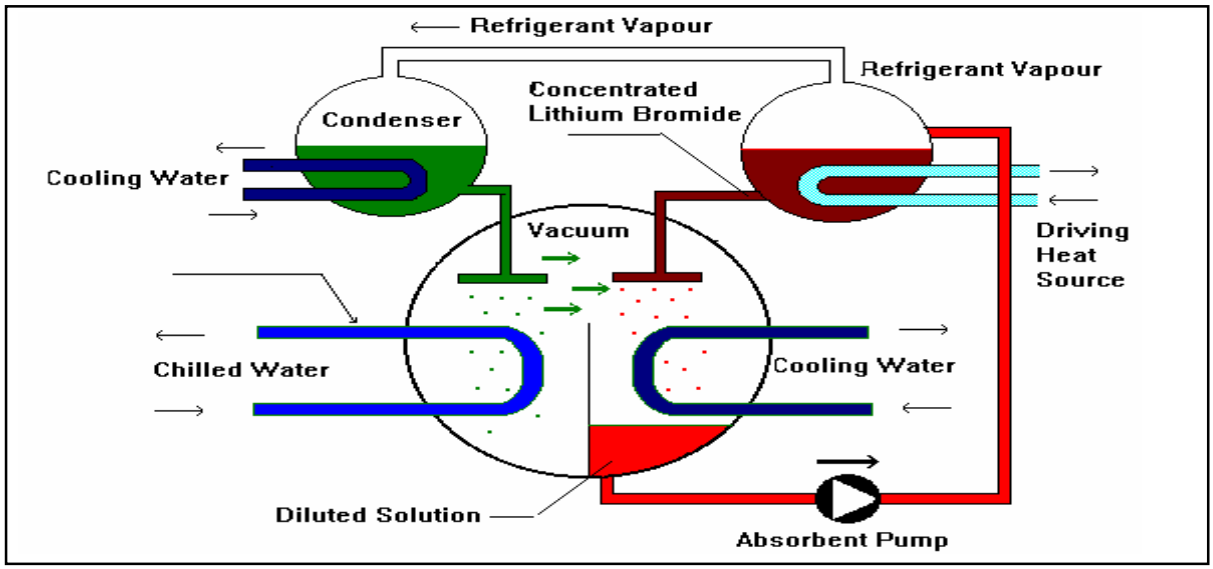
Waste Heat Source	: Exhaust gases
Exhaust gas Quantity	: 13578 kg/hr
Exhaust gas inlet temp	: 337 ^{o}C
Pressure Drop across HRU	: 100 mmWC

b) Hot Water Side Data

Pressure Drop across HRU	: 10 mlc
Losses considered	: 3% radiation loss

Vapour absorption Machine: The absorption cycle used in a VAM, is a process by which refrigeration effect is produced through the use of two fluids namely refrigerant and absorbent and some quantity of heat input, rather than electrical input as in the more familiar vapor compression cycle. Heat supplied in the generator section is added to a solution of LiBr-H_2O. This heat causes the refrigerant (water), to be boiled out of the solution in a distillation process. The water vapor that results passes into the condenser section where a cooling medium is used to condense the vapour back to a liquid state. The water then flows down to the evaporator section where it passes over tubes containing the fluid to be cooled. By maintaining a very low pressure in the absorber-evaporator shell, the water boils at a very low temperature. This boiling causes the water to absorb heat from the medium to be cooled, thus, lowering its temperature. The evaporated water then passes into the absorber section where it is mixed with a LiBr-H_2O solution that is very low in water content. This strong solution (rich in LiBr) tends to absorb the vapour from the

evaporator section to form a weaker solution. The weak solution is then pumped to the generator section to repeat the cycle. Thus, VAM produces chilled water for process from hot water as energy input. The schematic diagram of VAM is given below:



The technical specifications of the VAM are given below:

Capacity : 375 TR

Chilled Water Circuit

Chilled Water flow : 228 m^3/hr

Inlet temperature : 12 ^oC

Outlet temperature : 7 ^oC

Cooling water Circuit

Cooling Water flow : 390 m^3/hr

Inlet temperature : 32 ^oC

Outlet temperature : 37.6 ^oC

Hot Water Circuit

Hot water flow : 30 m^3/hr

Inlet temperature : 178 ^oC

Outlet temperature : 160 ^oC

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

>>

Years	Annual estimation of emission reduction (in tonnes of CO_2e)
2007-2008	1,783
2008-2009	1,783
2009-2010	1,783
2010-2011	1,783
2011-2012	1,783
2012-2013	1,783
2013-2014	1,783
2014-2015	1,783
2015-2016	1,783
2016-2017	1,783
Total estimated reductions (tonnes of CO_2e)	**17,830**
Total number of crediting years	**10 years**
Annual Average over the crediting period of estimated reduction (tonnes of CO_2e)	**1,783**

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:

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 not promoting another small scale CDM project activity in the same category and technology/measure. Therefore, 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:

>>

Title: Type II – Energy Efficiency Improvement projects

Category D - Energy Efficiency and fuel switching measures for industrial facilities.

Reference: The approved baseline methodology has been referred from the Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories - version 8 dated 23rd December 2006.

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

>>

The basic criterion for a small scale CDM project activity of Type (ii) Energy Efficiency Improvement projects is as follows:

- *This category comprises any energy efficiency and fuel switching measure implemented at a single industrial activity.*

The project activity conserves electricity consumption of Vapour compression chiller by replacing them with VAM. It is being implemented at a single industrial facility.

- *The aggregate energy savings of a single project may not exceed the equivalent of 60 GWh_e per year.*

Electricity consumption of vapour compressor chiller = 7450 kWh/day

Electricity consumption of VAM = 1632 kWh/day

Savings in electricity = 5822 kWh/day

= 5822 x 350 days/yr

= 20,36,300 kWh/yr

= 2.036 GWh_e/yr

The project activity clearly meets the criteria since the energy savings of the project activity is less than the specified limit.

- *The measures may replace, modify or retrofit existing facilities or be installed in a new facility.*

The project activity replaces vapour compressor chiller at existing facility.

The project activity meets the eligibility criteria for small-scale CDM project activities set out in Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories Type II Category D - version 8 - 23rd December 2006 and is not a de-bundled component of a larger project activity.

The monitoring plan has been drawn as per the guidance provided in paragraph 13 of 'Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories Type II - Category 1.D - version 8 – 23rd December 2006'.

B.3. Description of the project boundary:

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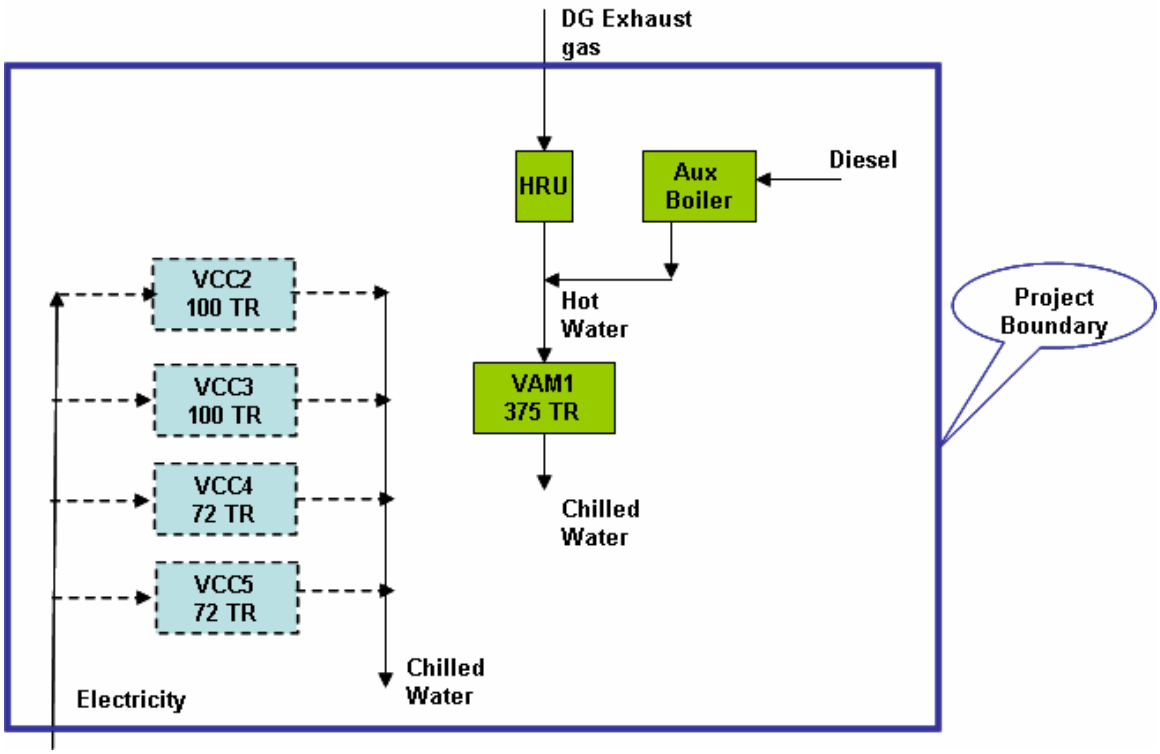
As per the guidelines provided in the approved methodology, the project boundary is the physical, geographical site of the industrial facility, processes or equipments that are affected by the project activity.

The project boundary covers the vapour compressor chillers, VAM, HRU and auxiliary boiler.

The schematic layout of project boundary is given below:



B.4. Description of 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 project activity conserves electricity drawn from TNEB. The baseline is the product of annual electricity (in kWh) savings times the southern grid emission factor of 0.86 kg CO_2/kWh detailed in Annex 3.

Date of completion of the baseline: 03/05/2007

Name of person/entity determining the baseline: M/s Delphi TVS Diesel Systems Ltd
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:

As per the 'Attachment A' to 'Appendix B', project participants need to provide an explanation to demonstrate that the project activity would not have occurred anyway. It has been discussed in the following paragraph that the project activity has associated barriers to its implementation and hence the emission reductions due to project activity are additional.

Technological barrier:

Although VAM is environmentally sound technology, due to some technical intricacies, it displays following barriers to implementation of the project activity.

Vacuum System: VAM is a vacuum system, which needs special care and maintenance. Otherwise machine will stop frequently. Vacuum leakage is frequent with passage of time due to thousands of expanded tubes with tube sheet joints. In the event of vacuum leakage, machine working becomes erratic. During such circumstances, fault finding of machine is extremely time consuming. Further, Lithium bromide (LiBr) circulated inside the tube is toxic. Skin contact with the anhydrous compound may lead to burns as a result of substantial dehydration due to tube failure. It will absorb and react with moisture in the skin, eyes and mucous membranes and can cause irritation. Inhalation or ingestion can cause vomiting, nausea, diarrhea, drowsiness, muscular weakness, lack of coordination, skin eruptions or rashes. This is huge risk due to the technology for the project activity.

Corrosion: Vacuum leaks are a serious problem adversely affecting the efficiency of the machine and causes corrosion in the unit. Thus, VAM is highly susceptible to corrosion and therefore life can be limited

if vacuum is not maintained properly. Expanded tube-to-tube sheet joints have tendency to leak periodically. This will act as huge technological risk for the project activity.

High Maintenance cost: Due to corrosion tube repairs and replacement are frequent. Copper Nickel tubes & Hermetic pumps are very expensive. Therefore tube replacement is very costly and hence maintenance cost is very high.

High cooling tower capacity: VAM generates more heat compared to vapour compression chillers. Apart from condenser, absorber also generates heat, therefore more water is required to dissipate the heat. Hence VAM requires additional cooling tower capacities approximately 1.3 times greater than electric chillers of the same size. Though an absorption chiller of the same size as an electric chiller can use the same cooling tower, but its capacity and efficiency will be reduced. It leads to high initial cost for auxiliaries and high pump operating cost as it handles large quantities of water.

Crystallization: LiBr tends to crystallise from the solution material due to overheating or overcooling of solution. Crystallization occurs when the machine operates too close to the saturation temperature of the LiBr solution and the LiBr begins to precipitate out of the solution. This is controlled by PLC. In case PLC control fails, machine will stop and will start only after LiBr becomes liquid. It is a nuisance and usually requires application of external heat to get the LiBr back into the solution. It requires additional maintenance care to recrystallize the LiBr.

On-line and Off-line changeover: Online /Offline change over takes time due to dilution cycle. Because of which, VAM would not be readily available when the system demands. It will take approximately 20 to 25 minutes time to align the VAM operation in line to the system. This characteristic due to the technology of VAM will act as nuisance during the operation.

It is clear from the above paragraphs that, D-TVS DSL has to face various kinds of technological risks during the operation of the project activity. In spite of these risks, project proponent has taken voluntary initiative to take up this project with CDM consideration hoping that CDM revenue would help to mitigate these risks.

Barrier due to Prevailing Practice:

Very few plants in India have installed VAM to generate chilled water. Among automobile sector in Tamil Nadu, few installations have been made of capacity falls between 50 TR to 235 TR. Although, it is environmentally sound technology, VAM technology is not well penetrated in this sector. D-TVS DSL is the first to implement 375 TR VAM in automobile sector in Tamil Nadu. D-TVS DSL has taken voluntary initiative to become the first automobile components manufacturing industry to implement VAM of this

size. Equipment supplier has appreciated D-TVS DSL for their effort and initiative towards this project activity.

Despite the above-mentioned barriers, the project proponent has taken up the project with consideration of CDM, hoping that the carbon revenue would help in mitigating these risks. The monetary benefits expected due to approval and registration of the project activity as a CDM activity would certainly improve the sustainability of the project activity.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The methodology was selected as suggested by the Indicative Simplified Baseline & Monitoring Methodologies for selected small-scale CDM project activity categories version 8 – 23rd December 2006.

The baseline scenario is determined by analyzing data from the electricity grid to which the project is connected. The project is conserving electricity drawn from TNEB grid system which forms a part of the Southern Regional Grid.

According to information from the Central Electricity Authority (CEA), the build margin and operating margin according to ACM0002 is available for determining the emission factor and the baseline emissions. For this project activity, latest CEA data released on 21st Dec 2006 was used.

The formula used for calculating emission reductions is given below:

$$ER_y = BE_y - PE_y - L_y$$

Where,

BE_y = baseline emissions

$$BE_y = SEC_y \times TR \times EF_y$$

Where

SEC_y – is the specific electricity consumption of baseline i.e. vapour compressor chillers, kWh/TR

EF_y – is the CO_2 baseline emission factor for the electricity displaced due to the project activity in tons CO_2/MWh.

TR – is the actual refrigeration effect of project activity in terms of Tonnes of refrigeration.

$$TR = M_{chw} \times Cp_{chw} \times \left(T_{in,chw} - T_{out,chw}\right)$$

Where

M_{chw} – Mass flow of chilled water, kg/hr

Cp_{chw} – Specific heat of chilled water

$T_{in,chw}$ – Inlet temperature of chilled water

CDM – Executive Board

$T_{out,chw}$ – Outlet temperature of chilled water

PEy = project emissions;

$$PE_y = \left(PEC_y \times EEF_y\right) + \left(FC_y \times FEF_y \times CV\right)$$

Where

PEC_y – is the electricity consumption of project activity i.e VAM.

EEF_y – is the baseline emission factor for the electricity displaced due to the project activity in tons CO_2/MWh.

FC_y – is fuel (Diesel) consumption of auxiliary boiler in litres.

FEF_y – the emission factor of fuel (Diesel).

CV – Calorific value of fuel (Diesel).

Ly = emissions due to leakage.

As per paragraph 5 of simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories - version 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. VAM is a new installation the dismantling equipment would be scrapped and hence there is no transfer of equipment from/to another activity.

Therefore Ly = 0 for this project activity.

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

Data / Parameter:	**EEF_y**
Data unit:	Kg CO_2/kWh
Description:	Baseline Emission Factor of the grid
Source of data used:	CO_2 baseline database for Indian Power Sector provided by the Central Electricity Authority (CEA)
Value applied:	0.86
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated from data provided by the CEA in the CO_2 baseline database for Indian Power Sector
Any comment:	Calculated as weighted sum of OM and BM emission factor

Data / Parameter:	**FEF_y**
Data unit:	Kg CO_2/TJ
Description:	Emission Factor of fuel (diesel)
Source of data used:	Page 2.16, Table 2.2, Chapter 2, Volume 2, 2006 IPCC Guideline for National Greenhouse gas inventories.
Value applied:	74,100
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated from data provided by 2006 IPCC Guideline
Any comment:	Constant value

Data / Parameter:	**SEC_y**
Data unit:	kWh/TR
Description:	Specific electricity consumption of Vapour compressor chillers. This data is quantitative.
Source of data to be used:	Delphi TVS Diesel Systems Limited
Value applied	25.2 (Variable).
Justification of the choice of data or description of measurement methods	100% of the data is to be monitored and measured online by using energy meter. The data will be archived on paper.

and procedures actually applied :	
Any comment:	Instrument used: Energy Meter, thermometer and flowmeter. Data Type: Quantity

Data / Parameter:	**CV**
Data unit:	TJ/Gg
Description:	Calorific Value of fuel (diesel)
Source of data used:	Page 1.18, Table 1.2, Chapter 1, Volume 2, 2006 IPCC Guideline for National Greenhouse gas inventories.
Value applied:	43.0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated from data provided by 2006 IPCC Guideline.
Any comment:	Constant value

B.6.3 Ex-ante calculation of emission reductions:

>>

The project activity reduces carbon dioxide emissions by saving electricity drawn from TNEB by implementing hot water driven VAM. The emission reduction ERy due to the project during a given year 'y' is calculated as the difference between baseline emissions (BEy), project emissions (PEy) and emissions due to leakage (Ly), as mentioned in section B.6.1.

The formula used for calculating emission reductions is given below:

$$ER_y = BE_y - PE_y - L_y$$

Where,

BE_y = baseline emissions

$$BE_y = SEC_y \times M_{chw} \times (T_{in.chw} - T_{out.chw}) \times EF_y$$

$$BE_y = SEC_y \times TR \times EF_y$$

= 25.2 kWh/TR x 300TR x 0.86 kg/kWh x 350 days/yr

= 2,274

PEy = project emissions;

$$PE_y = (PEC_y \times EEF_y) + (FC_y \times FEF_y \times CV)$$

= 1632 kWh/day x 0.86 kg/kWh x 350 days/yr

= 491

ERy = 2,274 – 491

= 1,783

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

>>

S No.	Operating Years	Baseline Emission Factor ($kgCO_2/kWh$)	Baseline Emissions $(tCO_2)e$	Project Emissions $(tCO_2)e$	Emission Reductions $(tCO_2)e$
1.	2007-08	0.86	2,274	491	1,783
2.	2008-09	0.86	2,274	491	1,783
3.	2009-10	0.86	2,274	491	1,783
4.	2010-11	0.86	2,274	491	1,783
5.	2011-12	0.86	2,274	491	1,783
6.	2012-13	0.86	2,274	491	1,783
7.	2013-14	0.86	2,274	491	1,783
8.	2014-15	0.86	2,274	491	1,783
9.	2015-16	0.86	2,274	491	1,783
10.	2016-17	0.86	2,274	491	1,783
		Total	**22,740**	**4910**	**17,830**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**PEC_y**
Data unit:	kWh
Description:	Electricity consumption of VAM. This data is quantitative.
Source of data to be used:	Delphi TVS Diesel Systems Limited
Value of data	Variable
Description of measurement methods and procedures to be	100% of the data is to be monitored and measured online. The data will be archived on paper.

applied:	
QA/QC procedures to be applied:	This data will be used for the calculation of project emission. Hence QA/QC procedures will be applied.
Any comment:	Instrument used: Energy Meter Data Type: Quantity

Data / Parameter:	$\mathbf{M_{chw}}$
Data unit:	Kg/hr
Description:	Mass flow of chilled water of VAM. This data is quantitative.
Source of data to be used:	Delphi TVS Diesel Systems Limited
Value of data	Variable
Description of measurement methods and procedures to be applied:	100% of the data is to be monitored and measured online. The data will be archived on paper.
QA/QC procedures to be applied:	This data will be used for the calculation of Baseline emission. Hence QA/QC procedures will be applied.
Any comment:	Instrument used: Flow meter. Data Type: Quantity

Data / Parameter:	$\mathbf{T_{in,chw}}$
Data unit:	^{o}C
Description:	Inlet temperature of chilled water to VAM. This data is quantitative.
Source of data to be used:	Delphi TVS Diesel Systems Limited
Value of data	Variable
Description of measurement methods and procedures to be applied:	100% of the data is to be monitored and measured online. The data will be archived on paper.
QA/QC procedures to be applied:	This data will be used for the calculation of Baseline emission. Hence QA/QC procedures will be applied.
Any comment:	Instrument used: Thermo meter. Data Type: Quantity

Data / Parameter:	$\mathbf{T_{out,chw}}$
Data unit:	^{o}C
Description:	Outlet temperature of chilled water from VAM. This data is quantitative
Source of data to be used:	Delphi TVS Diesel Systems Limited

Value of data	Variable
Description of measurement methods and procedures to be applied:	100% of the data is to be monitored and measured online. The data will be archived on paper.
QA/QC procedures to be applied:	This data will be used for the calculation of Baseline emission. Hence QA/QC procedures will be applied
Any comment:	Instrument used: Thermo meter Data Type: Quantity

Data / Parameter:	**FC_y**
Data unit:	Tons
Description:	Fuel consumption in auxiliary boiler
Source of data to be used:	Delphi TVS Diesel Systems Limited
Value of data	Variable
Description of measurement methods and procedures to be applied:	100% of the data is to be monitored and measured online. The data will be archived on paper.
QA/QC procedures to be applied:	This data will be used for the calculation of project emission. Hence QA/QC procedures will be applied.
Any comment:	Instrument used: Tank level measurement Data Type: Quantity

B.7.2 Description of the monitoring plan:

>>

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 project activity replaces 2 x 100 TR and 2 x 72 TR vapour compression chillers by VAM and thereby results in reduction of electricity consumption. It is essential to monitor the electricity consumption of vapour compression chillers.

The electricity consumption of each vapour compression chillers are measured and monitored by energy meters. Energy meter readings are noted on a daily basis and recorded in a log book which is further verified by the appointed personnel regularly. A monthly generation report are prepared using energy meter readings and aggregated for the project.

Diesel would be used in auxiliary boiler to generate hot water. Diesel consumption in auxiliary boiler would be measured on daily basis by level measurement of the fuel tank and recorded in a log book which is further verified by the stock register. Daily readings would be aggregated to monthly report.

Refrigeration effect of VAM would be monitored on daily basis by measuring flow and inlet & outlet temperature of chilled water. It is further recorded in a log book on daily basis.

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

>>

Date of completion and application of baseline and monitoring methodology: 03/05/2007

Contact Person:

Mr. M.N.Subramanian

Vice president – Finance & Secretary

Delphi TVS Diesel Systems Limited

Mannur, Thodukadu

Sriperumbudur Taluk

Kanchipuram District, Tamil Nadu, India.

PIN : 602 105

Tel: +91 98403 96959

Email: mns.fin@delphitvs.com

The entity is a project participant listed in Annex 1.

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:

>>
18/01/2007

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

>>
25 years, 0 months

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

The project activity would use a fixed ten years 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:

>>
09/11/2007 or upon registration of project activity with UNFCCC.

C.2.2.2. Length:

>>
10 years 0 months

SECTION D. Environmental impacts

>>

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

>>

Not applicable

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:

>>

As per the Environment Impact Assessment Notification S.O.60(E)[1], dated 27/01/1994 (Amendment on 14th September 2006), this project activity does not fall under the purview of Environmental Impact Assessment notification of the Ministry of Environment and Forests -Government of India.

[1] Source: 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 following are the stakeholders identified for the project activity:

1. Employees
2. Tamil Nadu Electricity Board
3. NGOs
4. Equipment Suppliers
5. Consultants

D-TVS DSL invites concerned stakeholders for consultation process at Mannur with the objective to inform about the environmental and social impacts of the project activity and discuss their concerns regarding the project activity.

E.2. Summary of the comments received:

>>

Employees: The employees have expressed their support on understanding the various benefits of project activity. They appreciated that the project activity would not only result in savings in electricity but also reduce GHG emissions. There were no major comments/concerns raised by the employees.

Tamil Nadu Electricity Board (TNEB): TNEB doesn`t have any concerns against the implementation of project activity.

NGOs: NGO`s haven`t put forward any concerns against the project activity.

Equipment suppliers: The equipments would be supplied by the equipment supplier as per the specifications finalized for the project and erection & commissioning of the equipments at the site would be done. Equipment suppliers appreciate D-TVS DSL efforts to take up such project activity.

Consultants: Consultants would be involved in the project activity to take care of the various pre contracts and post contract activities like preparation of basic and detailed engineering documents, preparation of tender documents, selection of vendors / suppliers, supervision of project operation, implementation, successful commissioning and trial run. Consultants doesn`t have any concerns regarding the project activity.

In summary, there is no negative concern raised by any of the stakeholders regarding this project activity.

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 modalities and procedures, the PDD would be published at the DOE`s web site for global stakeholder comments**.**

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Delphi TVS Diesel Systems Limited
Street/P.O.Box:	Mannur, Thodukadu (Post), Sriperumbudur Taluk, Kancheepuram District,
Building:	
City:	
State/Region:	Tamil Nadu
Postfix/ZIP:	602 105
Country:	India
Telephone:	+91-44-2765 8454
FAX:	+91-44-2765 9116
E-Mail:	mns.fin@delphitvs.com
URL:	www.delphitvs.com
Represented by:	
Title:	Vice President
Salutation:	Mr
Last Name:	M.N
Middle Name:	
First Name:	Subramanian
Department:	Finance & Secretary
Mobile:	+91-98403 96959
Direct FAX:	+91 44 – 27658351
Direct tel:	+91 44 – 27658196
Personal E-Mail:	mns.fin@delphitvs.com

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

CENTRAL ELECTRICITY AUTHORITY: CO2 BASELINE DATABASE[2]												
VERSION			**1.1**									
DATE			**21 Dec 2006**									
EMISSION FACTORS												
Weighted Average Emission Rate (tCO2/MWh) (excl. Imports)							**Weighted Average Emission Rate (tCO2/MWh) (incl. Imports)**					
	2000-01	2001-02	2002-03	2003-04	2004-05			2000-01	2001-02	2002-03	2003-04	2004-05
North	0.72	0.73	0.74	0.71	0.71		North	0.72	0.73	0.74	0.71	0.72
East	1.09	1.06	1.11	1.10	1.08		East	1.09	1.03	1.09	1.08	1.05
South	0.73	0.75	0.82	0.85	0.79		South	0.74	0.75	0.82	0.85	0.79
West	0.90	0.92	0.90	0.90	0.92		West	0.90	0.92	0.90	0.90	0.92
North-East	0.39	0.38	0.37	0.36	0.30		North-East	0.39	0.38	0.37	0.36	0.46
India	0.82	0.83	0.85	0.85	0.84		India	0.82	0.83	0.85	0.85	0.84
Simple Operating Margin (tCO2/MWh) (excl. Imports)							**Simple Operating Margin (tCO2/MWh) (incl. Imports)**					
	2000-01	2001-02	2002-03	2003-04	2004-05			2000-01	2001-02	2002-03	2003-04	2004-05
North	0.98	0.98	1.00	0.99	0.97		North	0.98	0.98	1.00	0.99	0.98
East	1.22	1.22	1.20	1.23	1.20		East	1.22	1.19	1.17	1.20	1.17
South	1.02	1.00	1.00	1.01	1.00		South	1.03	1.00	1.00	1.01	1.00
West	0.98	1.01	0.98	0.99	1.01		West	0.98	1.01	0.98	0.99	1.01
North-East	0.67	0.66	0.68	0.62	0.66		North-East	0.67	0.66	0.68	0.62	0.81
India	1.02	1.02	1.02	1.03	1.03		India	1.01	1.02	1.01	1.02	1.02
Build Margin (tCO2/MWh) (excl. Imports)							**Build Margin (tCO2/MWh) (not adjusted for imports)**					
	2000-01	2001-02	2002-03	2003-04	2004-05			2000-01	2001-02	2002-03	2003-04	2004-05
North					0.53		North					0.53
East					0.90		East					0.90

[2] Source: Central Electricity Authority of India (2006)

South					0.72	
West					0.78	
North-East					0.10	
India					0.70	

South						0.72
West						0.78
North-East						0.10
India						0.70

Combined Margin (tCO2/MWh) (excl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05
North	0.76	0.76	0.77	0.76	0.75
East	1.06	1.06	1.05	1.07	1.05
South	0.87	0.86	0.86	0.86	0.86
West	0.88	0.89	0.88	0.88	0.90
North-East	0.39	0.38	0.39	0.36	0.38
India	0.86	0.86	0.86	0.86	0.86

Combined Margin in tCO2/MWh (incl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05
North	0.76	0.76	0.77	0.76	0.75
East	1.06	1.05	1.04	1.05	1.04
South	0.87	0.86	0.86	0.86	0.86
West	0.88	0.89	0.88	0.88	0.89
North-East	0.39	0.38	0.39	0.36	0.45
India	0.86	0.86	0.86	0.86	0.86

GENERATION DATA

Gross Generation Total (GWh)

	2000-01	2001-02	2002-03	2003-04	2004-05
North	144,292	151,185	155,385	165,735	168,438
East	58,936	64,048	66,257	75,374	85,776
South	128,983	131,902	136,916	138,299	144,086
West	162,329	165,805	177,399	172,682	183,955
North-East	5,314	5,292	5,811	5,880	7,904
India	499,854	518,231	541,766	557,970	590,158

Net Generation Total (GWh)

	2000-01	2001-02	2002-03	2003-04	2004-05
North	135,230	141,415	144,741	155,043	157,290
East	53,350	58,097	59,841	68,428	77,968
South	121,144	123,612	127,780	128,165	134,691
West	150,412	153,125	164,448	159,780	170,726
North-East	5,185	5,169	5,669	5,758	7,776
India	465,321	481,417	502,480	517,174	548,451

20% of Net Generation (GWh)

	2000-01	2001-02	2002-03	2003-04	2004-05
North	27,046	28,283	28,948	31,009	31,458

EMISSION DATA

Absolute Emissions Total (tCO2)

	2000-01	2001-02	2002-03	2003-04	2004-05
North	97,863,848	102,743,113	106,777,065	109,980,786	112,199,697
East	58,025,890	61,436,757	66,595,529	75,515,998	83,956,860
South	88,728,956	92,484,478	104,180,940	108,406,007	105,960,087
West	135,147,507	141,597,621	148,313,340	144,127,175	157,781,065
North-East	2,009,681	1,976,535	2,090,087	2,088,985	2,294,430
India	381,775,882	400,238,503	427,956,961	440,118,951	462,192,140

Absolute Emissions OM (tCO2)

	2000-01	2001-02	2002-03	2003-04	2004-05
North	97,863,848	102,743,113	106,777,065	109,980,786	112,199,697
East	58,025,890	61,436,757	66,595,529	75,515,998	83,956,860
South	88,728,956	92,484,478	104,180,940	108,406,007	105,960,087
West	135,147,507	141,597,621	148,313,340	144,127,175	157,781,065
North-East	2,009,681	1,976,535	2,090,087	2,088,985	2,294,430
India	381,775,882	400,238,503	427,956,961	440,118,951	462,192,140

Absolute Emissions BM (tCO2)

	2000-01	2001-02	2002-03	2003-04	2004-05
North					17,108,583

	East	10,670	11,619	11,968	13,686	15,594		East					14,303,611
	South	24,229	24,722	25,556	25,633	26,938		South					19,525,581
	West	30,082	30,625	32,890	31,956	34,145		West					26,881,491
	North-East	1,037	1,034	1,134	1,152	1,555		North-East					206,514
	India	93,064	96,283	100,496	103,435	109,690		India					78,025,780
	Share of Must-Run (Hydro/Nuclear) (% of Net Generation)											
		2000-01	2001-02	2002-03	2003-04	2004-05						
	North	25.9%	25.7%	26.1%	28.1%	26.8%						
	East	10.8%	13.4%	7.5%	10.3%	10.5%						
	South	28.1%	25.5%	18.3%	16.2%	21.6%						
	West	8.2%	8.5%	8.2%	9.1%	8.8%						
	North-East	42.3%	42.1%	45.8%	41.8%	55.4%						
	India	19.2%	18.9%	16.3%	17.1%	18.0%		**IMPORT DATA**					
	Net Generation in Operating Margin (GWh)							**Net Imports (GWh) - Net exporting grids are set to zero**					
		2000-01	2001-02	2002-03	2003-04	2004-05			2000-01	2001-02	2002-03	2003-04	2004-05
	North	100,189	105,076	106,940	111,449	115,151		North	0	0	0	0	3,616
	East	47,570	50,308	55,377	61,378	69,746		East	489	555	357	1,689	0
	South	87,100	92,085	104,441	107,396	105,584		South	1,162	1,357	518	0	0
	West	138,071	140,173	150,889	145,264	155,731		West	321	0	797	962	285
	North-East	2,992	2,995	3,071	3,350	3,469		North-East	0	0	0	0	2,099
	India	375,923	390,638	420,718	428,838	449,681							
	Net Generation in Build Margin (GWh)							**Share of Net Imports (% of Net Generation)**					
		2000-01	2001-02	2002-03	2003-04	2004-05			2000-01	2001-02	2002-03	2003-04	2004-05
	North					32,067		North	0.0%	0.0%	0.0%	0.0%	2.3%
	East					15,818		East	0.9%	1.0%	0.6%	2.5%	0.0%
	South					27,195		South	1.0%	1.1%	0.4%	0.0%	0.0%
	West					34,587		West	0.2%	0.0%	0.5%	0.6%	0.2%
	North-East					2,052		North-East	0.0%	0.0%	0.0%	0.0%	27.0%
	India					111,718							

Annex 4

MONITORING INFORMATION

The project proponent has a well defined project management structure for monitoring the project activity. The monitoring plan is discussed in section B7.

Appendix 1

Abbreviations

CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CFC	Chloro Fluoro Carbon
CO_2	Carbon Di Oxide
DG	Diesel Generator
DOE	Designated Operational Entity
D-TVS DSL	Delphi TVS Diesel Systems Limited
GHG	Greenhouse Gas
GWh	Giga Watt hour
HRU	Heat Recovery Unit
IPCC	Intergovernmental Panel on Climate Change
kWh	kilo Watt hour
LiBr	Lithium Bromide
NGO	Non Governmental Organisation
PDD	Project Design Document
QA	Quality Assurance
QC	Quality Control
TNEB	Tamil Nadu Electricity Board
TR	Tonnes of Refrigeration
VAM	Vapour Absorption Machine

Appendix 2

References

1	Kyoto Protocol to the United Nations Framework Convention on Climate Change
2	Website of United Nations Framework Convention on Climate Change (UNFCCC), http://unfccc.int
3	UNFCCC document: Simplified modalities and procedures for small-scale clean development mechanism project activities
4	UNFCCC document: Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories.
5	http://envfor.nic.in/legis/eia/so-60(e).html
6	2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Enclosure 1 : CER Calculations

Estimation of Emission Reduction

Baseline emissions		
Electricity consumption of vapour compressor chillers	kWh/day	7450
Refrigeration effect of vapour compressor chillers	TR	296
Specific electricity consumption	kWh/TR	25.2
Refrigeration effect of vapour absorption machine	TR	300
Estimated Electricity consumption	kWh/day	7555
Emission Factor	kg/kWh	0.86
Operating days	days/yr	350
Baseline emissions		2274
Project emissions		
Electricity consumption of vapour absorption machine	kWh/day	1632
Emission Factor	kg/kWh	0.86
Diesel consumption in auxiliary boiler	lit	0
Calorific value of diesel	TJ/Gg	43
Density of diesel	kg/lit	0.8
Emission Factor of diesel	kg/TJ	74100
Project emissions		491
Leakage		0
Emission Reduction		**1783**

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