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

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

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

Energy efficiency project at Asahi India Glass Ltd., Bawal, Rewari.
Date : 25/03/2008
Version : 1

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

The project activity is the installation of waste heat recovery system behind existing furnace oil (FO) fired engines in the Bawal Glass manufacturing unit of Asahi India Glass Ltd. (hereafter project participant or AIS). The project activity primarily aims at reducing green house gas (GHG) emissions through increase in efficiency. The project activity covers replacement of the conventional heating system (electric heaters & FO fired thermic fluid heaters) and replacement of the conventional mechanical compression cooling system by Vapour Absorption Chilling system.

The project activity is helping in sustainable development by GHG emission reduction. Project activity is using more efficient system and replacing the conventional system and thus reducing the emissions in the atmosphere. The erection and commissioning of project will lead to direct/ indirect employment to contactors/ sub-contactors and contract labours.

View of project participants on the contribution of the project activity to sustainable development:

AIS which is the owner of the project activity, believes that the project activity will contribute and has further potential to shape the economic, environmental and social life of the people in the region.

Contribution of Project Activity to Sustainable Development:

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

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

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

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

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

4. Technological well-being

1. Social well being:

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

2. Economic well being:

- The project activity generates employment in the local area.
- Energy savings, in terms of energy units and costs, benefits the industry
- The project creates a business opportunity for local stakeholders such as bankers, consultants, suppliers, manufacturers, contractors etc.

3. Environmental well being:

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

4. Technological well being:

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

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

A.3 Project participants:

Name of 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.	• Private entity - M/s Asahi India Glass Ltd. (AIS)	No.
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party (ies) involved is required.		

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

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

A.4.1.1	Host Party(ies):

India

A.4.1.2	Region/State/Province etc.:

Haryana

A.4.1.3	City/Town/Community etc:

Tehsil – Bawal, Dist. – Rewari

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

The project activity will be installed in the existing facility of AIS. The project activity will be located at Bawal 15 km from the Rewari city in Haryana, India. Bawal is located between latitude of 28.08^0N and longitude of 76.58^0E at altitude of 872 Ft.

Figure 01: Site Location

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

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

- Type :III –Other Projects Activities
- Project Category :Energy efficiency and fuel switch measures for industrial facility (III.Q) Version 01

Captioned project basically includes recovery of heat from flue gases of FO fired generator sets for process heating and chilling. They are as follows-:

- Replacement of the conventional heating system i.e. electric heaters & FO fired thermic fluid heaters for process heating.
- Replacement of the conventional mechanical compression cooling system by Vapour Absorption Chilling system.

The system incorporates a heat recovery unit (HRU) that will be placed in exhaust gas path of the FO fired engines to heat up thermic fluid. Exhaust gases will be flowing to the HRU through a 3 way motorized damper. Depending on plant load, it will allow the gases to go through HRU or bypass to atmosphere through existing chimney. Exhaust gases will be cooled from 290 °C to 187 °C at rated load and can generate heat of 14.7 lac kCal/hr from 2 X 3.6 MW engines. This heat will be picked by thermic fluid which will enter at 175 °C and leave the HRU at 237 °C.

HRU will be located just outside the engine room and thermic fluid will be pumped to the existing thermic fluid heater area, where AIS has been able to replace existing thermopac (2.75 lac kcal TP04), two electric heaters (100 kW and 80 kW respectively) in dehumidifiers with thermic fluid radiators and electric heaters of 600 kW connected load (avg. load is 220 kW) by thermic fluid radiators for hot air. Returning thermic fluid will be passing through a heat exchanger which will heat up water from 152 °C to 162 °C.

Hot water thus generated will be utilized in Vapour Absorption Machine (VAM) machine. Absorption machine will generate chilled water at 7 °C from 12 °C returning water. Existing Direct Expansion (DX) system will be converted to Chilled Water (CHW) system by adding Air handling unit (AHUs) and Fan Coil Unit (FCU'S).The system incorporate cooling tower and pump-sets with necessary piping and valves. Absorption machine needs cooling water at 32 °C.

To take care of the volumetric expansion of the thermic fluid due to temperature increase and releasing air (gas) from the thermic fluid pipe line, an expansion tank will be provided. The expansion tank will be at above the highest point elevation in the thermic fluid system.
AIS have designed the system in such a way to utilize the system with extra flexibility, as during peak requirement of heating, cooling load will be lesser and during peak requirement of cooling, heating load will be lesser and AIS can utilize the extra heating and cooling during peak requirements accordingly to get maximum out put out of the system.

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

Years	Annual estimation of emission reductions in tonnes of CO_2
2008 – 09	3654
2009 – 10	3654
2010 – 11	3654
2011 – 12	3654
2012 – 13	3654
2013 – 14	3654
2014 – 15	3654
2015 – 16	3654
2016 – 17	3654
2017 – 18	3654
Total estimated reductions (tonnes of CO2 e)	**36540**
Total number of crediting years	10
Annual average of the estimated reductions over the crediting period (tCO2 e)	3654

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

No ODA was received for the proposed project activity.

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

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

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

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

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

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: Other Project Activities - III.Q. Waste gas based energy systems (Version 01)

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

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

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

- Type :III –Other Projects Activities
- Project Category :Energy efficiency and fuel switch measures for industrial facility (III.Q) Version 01

Requirements with respect to technology/measure under III.Q. Waste gas based energy systems (Version 01) are as follows.

1. The category is for project activities that utilize waste gas and/or waste heat at existing facilities as an energy source for:

   • Cogeneration; or
   • Generation of electricity; or
   • Direct use as process heat; or
   • For generation of heat in elemental process (e.g. steam, hot water, hot oil, hot air).

2. The category is also applicable to project activities that use waste pressure to generate electricity at existing facilities.
3. The recovery of waste gas/heat may be a new initiative or an incremental gain in an existing practice.
4. In case the project activity is an incremental gain, the difference between the technology used before project activity implementation and the project technology should be clearly shown. It should be demonstrated why there are barriers for the project activity that did not prevent the implementation of the technology used before the project activity implementation.
5. Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually. Wherever the measures lead to waste heat recovery which is incremental to an existing practice of waste heat recovery, only the incremental gains in

GHG mitigation should be taken into account and such incremental gains shall result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.

6. The category is applicable under the following conditions:

- The energy produced with the recovered waste gas/heat or waste pressure should be measurable.
- Energy generated in the project activity shall be used within the facility where the waste gas/heat or waste pressure is produced. An exception is made for the electricity generated by the project activity which may be exported to the grid.
- The waste gas/heat or waste pressure utilized in the project activity would have been flared or released into the atmosphere in the absence of the project activity. This shall be proven by one of the following options:

    - By direct measurements of energy content and amount of the waste gas/heat or waste pressure for at least three years prior to the start of the project activity.
    - Energy balance of relevant sections of the plant to prove that the waste gas/heat or waste pressure was not a source of energy before the implementation of the project activity. For the energy balance the representative process parameters are required. The energy balance must demonstrate that the waste gas/heat or waste pressure was not used and also provide conservative estimations of the energy content and amount of waste gas/heat or waste pressure released.
    - Energy bills (electricity, fossil fuel) to demonstrate that all the energy required for the process (e.g. based on specific energy consumption specified by the manufacturer) has been procured commercially. Project participants are required to demonstrate through the financial documents (e.g. balance sheets, profit and loss statement) that no energy was generated by waste gas/heat or waste pressure and sold to other facilities and/or the grid. The bills and financial statements should be audited by competent authorities.
    - Process plant manufacturer's original specification/information, schemes and diagrams from the construction of the facility could be used as an estimate of quantity and energy content of waste gas/heat produced for rated plant capacity per unit of product produced.

7. For the purpose of this category waste gas/heat/pressure is defined as: by-product gas/heat or pressure of machines and technical processes for which no useful application is found in the absence of the project activity and for which it can be demonstrated that it has not been used prior to, and would not be used in absence of the CDM project activity (e.g. because of low pressure, heating value or quantity available). In the project scenario, this waste gas/heat/pressure is recovered and conditioned for use.

The project activity fits under AMS III.Q - Waste gas based energy systems. The project activity recovers heat from the waste gas and generates hot oil.

The indicative simplified baseline and monitoring methodology applicable to category III.Q has been used for the project including baseline calculations. The emission reduction calculation is based on amount of heat recovered from the waste gas by the project activity. The annual emission reduction from the project activity is 3654 tCO_2e, which is well below the limit of 60 $ktCO_2e$, as specified in the methodology.

The applicability criteria(s) of the applied methodology, AMS III.Q, with relevant project justifications), are as follows:

Para	Methodology Requirement	Applicability of Project Activity
1.	*The category is for project activities that utilize waste gas and/or waste heat at existing facilities as an energy source for:* • *Cogeneration; or* • *Generation of electricity; or* • *Direct use as process heat source; or* • *For generation of heat in element process (e.g. steam, hot water, hot oil, hot air).*	The project activity entails recovery of the heat content of the waste gas generated from DG sets, utilization of the same in waste heat recovery system to generate hot thermic fluid. Therefore the project activity meets the applicability condition of the methodology.
2.	*The category is also applicable to project activities that use waste pressure to generate electricity at existing facilities.*	The project activity does not involve usage of the waste gas pressure for generation of electricity. Therefore this applicability condition is not applicable for the project activity under consideration.
3.	*The recovery of waste gas/heat may be a new initiative or an incremental gain in an existing practice.*	The project activity is a new initiative taken by the project proponent and before the project activity there has been no waste heat recovery.
5.	*Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO2 equivalent annually.*	The annual emission reduction from the project activity is about 3654 $ktCO_2e$ which is below the limit of 60 $ktCO_2e$ as specified in the methodology.
6.	*The category is applicable under the following conditions:* • *The energy produced with the recovered waste gas/heat or waste pressure should be measurable* • *Energy generated in the project activity shall be used within the facility where the waste gas/heat or waste pressure is produced. An exception is made for the electricity generated by the project activity which may be exported to the grid.* • *The waste gas/heat or waste pressure utilized in the project activity would have been flared or released into the atmosphere in the absence of the project activity.*	The energy recovered by the project activity can be measured and monitored by the project proponent. The energy recovered by the project activity will be utilized within the facility where the waste gas is produced. Before the project activity, the waste gas produced by the DG sets was being released in to the atmosphere Therefore the project activity meets the applicability condition of the methodology.

7.	*For the purpose of this category waste gas/heat/pressure is defined as: by-product gas/heat or pressure of machines and technical processes for which no useful application is found in the absence of the project activity and for which it can be* demonstrated *that it has not been used prior to, and would not be used in absence of the CDM project activity (e.g. because of low pressure, heating value or quantity* available*). In the project scenario, this* waste *gas/heat/pressure is recovered and* conditioned *for use.*	The waste gas utilized in the project activity is the exhaust gas obtained from the DG sets which were exhausted in to the atmosphere before the project activity. The heat available in the exhaust gas was not utilized before the project activity because of technical barriers explained in Section B. Therefore the project activity meets the applicability condition of the methodology.

B.3 Description of the project boundary:

The physical, geographical site of the facility where the heat is produced and transformed into useful energy delineates the project boundary. Project boundary includes all energy efficiency schemes listed in section A.4.2.

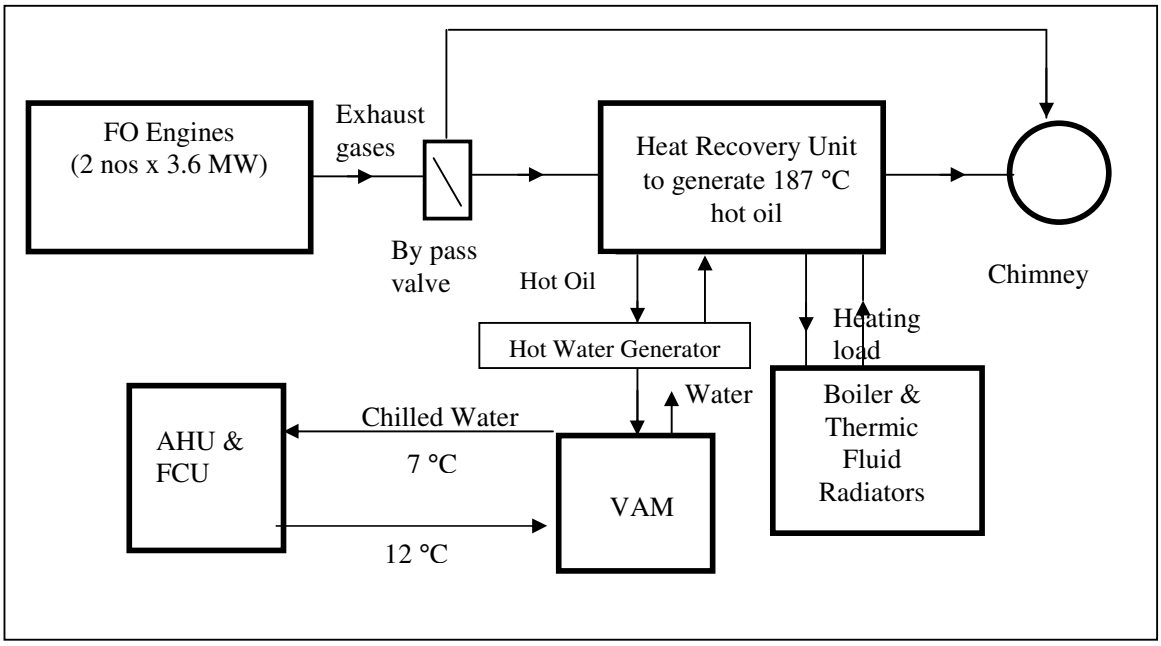


Figure 2, : Project Boundary

B.4 Description of baseline and its development:

Detail of the energy and emission baseline has been developed using the baseline methodology prescribed by the UNFCCC in Appendix B to Simplified M&P for small scale COM projects activities belonging to AMS III.Q.

As per para 9 of AMS III.Q "*For computing the emissions in the baseline the procedure provided in paragraphs 6 to 13 of AMS I.C shall be used*".

From paragraphs 6 to 13 of AMS I.C paragraph 10 is applicable for this project which is as follows:

10. For steam/heat produced using fossil fuels the baseline emissions are calculated as follows:

$$BEy = HGy * EF\ CO_2 / \eta_{th}$$

Where:

BEy the baseline emissions from steam/heat displaced by the project activity during the year y in tCO2e.

HGy the net quantity of steam/heat supplied by the project activity during the year y in TJ.

$EFCO_2$ the CO2 emission factor per unit of energy of the fuel that would have been used in the baseline plant in (tCO2 / TJ), obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used.

η_{th} the efficiency of the plant using fossil fuel that would have been used in the absence of the project activity.

Step I: Determination of Energy Baseline

In the absence of the project activity, the existing furnace oil fired units and electricity consumption from the grid would have continued over the entire crediting period. Therefore, the energy baseline would be the furnace oil consumption of thermic fluid heaters and electricity consumption from the grid equivalent to power saving by the Waste Heat Recovery. Thus, the energy sources primarily include furnace oil and electricity consumption. The base line data (two years data of the years prior to project implementation) has been used to determine the energy baseline.

Step II: Determination of carbon intensity of the chosen baseline

As stated above, there are three energy sources

- Electrical energy drawn from Northern Region Grid and produced in FO based CPP
- Thermal energy generated from furnace oil combustion for steam boilers and

The emission coefficient for each of these sources has been determined herein:

(A) Emission Coefficient of the Northern Regional Grid

In the proposed baseline, Northern Region grid is used as the reference region for estimating the current generation mix. Using the methodology available for small-scale project activities, the weighted average emissions (t CO_2 e/GWh) of current generation mix of Northern Region grid of India is used for the calculation of baseline. The weighted average emission factor data calculated and provided by Central Electricity Authority (CEA)[2] is used for the proposed project activity.

(B) Emission Coefficient for Furnace Oil (FO)

The emission coefficient is based on NCV and Emission Factor

As per the provisions of paragraph 59 of Appendix B of Simplified Modalities and Procedures for Small Scale COM Project Activities [FCCC/CP/2002/7/Add.3, English, Page 21], the emission coefficient (measured in kg of CO_2 / kg of Furnace Oil) for the furnace oil reduced had been calculated in accordance with the IPCC default values as well as the laboratory analysis and stoichiometric analysis.

Emission Factors

The emission factors are based on IPCC Guidelines for National Greenhouse Gas Inventories and are given below.

Fuel	Emission Factor (kg CO_2/TJ)[3]	Emission factor (kg CO_2/kg)[4]	Calorific Value (TJ/Gg)[5]
Residual Fuel Oil (Furnace Oil)	77400	3.13	40.40

B.5 Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

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

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

- **Additionality**

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

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

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

a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;

b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;

c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;

d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

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

The project suffered technical barriers, in obtaining management consent for execution, due to the following circumstances:

The project is novel in the entire Indian industry and to the glass industry. Recovery of heat from engine exhaust to generate steam or hot water is well proven. The process at AIS requires thermic fluid at 237 °C temperature. The process does not require hot water or steam. Recovery of heat from engine flue gases to heat the return thermic fluid and displace fossil fuel is totally novel or first of its kind. Though the suppliers and engineers were confident of the success, the uniqueness of the project provided a stumbling block. It was also not practical, to install or try a pilot plant. In the absence of data of any proven similar waste heat recovery project, it was difficult to establish the reliability and issues of concern.

Glass making is traditionally a continuous process industry. Hence, M/s. AIS prefers expensive DG power to the utility supplies, as the same is lesser reliable. Any power tripping in the glass sector has a serious impact on the value and quantum of production. Business as usual with DG set (including standby) for reliable power with oil fired thermic fluid heaters for process heating and mechanical compressors (with standby) for cooling are safe options and were being practiced.

The technical barriers being faced were primarily due to absence of data or experience from any other similar waste heat energy recovery projects and include:

- Recovering heat from flue gas between 240 to 187 °C with thermic fluid heat at 237 °C outlet and 175 °C inlet, without phase change, did raise certain issues like appropriate heat transfer area
- Severe requirements of soot blowing due to high dust concentration in engine exhaust
- Providing effective hot flue bypass during low circulation of thermic fluid
- Additional equipment for O&M which are not part of the core business
- Requirement of installation of hot water generator in the return path of thermic fluid to obtain appropriate temperature differential for heat transfer. This also results in additional investment in hot water generator using thermic fluid & hot water fired vapour absorption chillers

- Requirement of retaining & maintaining the existing oil fired thermic fluid heaters and mechanical refrigeration compressors, as standby units because of the lack of experience and low credibility of the heat recovery system.

These technical barriers could have severe financial implications on the facility operations, as compared to the savings potential from the waste heat recovery. This was due to the below factors:

- All the engines including standbys are connected to a common chimney. The waste heat recovery unit would be installed before this chimney. A bypass to the heat recovery unit is provided. However, possibility of requirement of shutting down all the DG sets during any outage of the waste heat recovery system could occur. This will lead to total closure of all activities in the facility, loss of material on which work is in progress and loss of production. AIS caters mainly to the automotive industry. Most of its buyers follow no inventory scheme, wherein the requirement of prompt and timely supply is critical to retain market share.
- Standby oil fired thermic fluid heaters and mechanical compressors are to be maintained in event of outage of the waste heat recovery system. However, bringing these standbys into operation during any outage will also require considerable time. Each equipment would have its own start-up procedure and all the necessary changeover valves will need to be operated. Hence any outage in the system will lead to a stoppage in production due to absence of required process heat & cooling. Apart from financial loss due to decrease in production, this would also upset the entire production & manufacturing chain.

From the above submissions, it is evident that the energy conservation project by recovering engine flue gas waste heat by heating of thermic fluid had significant technical barriers which could have substantial impact on the facility operations & financials.

The management of AIS remains committed to ecological & environmental preservations. Energy conservation has always been an important agenda for the organisation. The additional fiscal benefits which could be received due to the energy savings and corresponding CERs will motivated the management to take such projects. Apart from fiscal benefits, the management of AIS were extremely keen to participate in the CDM under Kyoto Protocol, as their contribution towards decrease in GHG emissions. The fiscal benefits and philosophy of the Kyoto Protocol provided the opportunity based on which the threats to the above barriers could be taken.

B.6 Emission reductions:

B.6.1 Explanation of methodological choices:

The procedure followed for estimating the emissions reductions from this project activity during the crediting period are as per the following steps:

Step 1: Calculation of baseline emission

$BE_y = BE_{FO,y} + BE_{Grid,y}$

Where,

BE_y	is the baseline emission in year Y,
$BE_{FO,y}$	the baseline emission due to use of furnace oil in year Y,
$BE_{Grid,y}$	the baseline emission due to use of grid electricity in year Y,

Step 2: Calculation of baseline emission due to FO

$BE_{FO,y} = HGy * EF_{FO, CO2}$

Where,

$BE_{FO,y}$	the baseline emissions from steam/heat generated by FO displaced by the project activity during the year y in tCO2e.
HG_y	the net quantity of heat displaced by the project activity during the year y in TJ.
$EFCO_2$	the CO_2 emission factor per unit of energy of the fuel that would have been used in the baseline plant in (tCO_2 / TJ), obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used.

Step 3: Calculation of baseline emission due to electricity

$BE_{Grid,y} = Q_{Elec.y,} * EF_{Grid,Y}$

Where,

$BE_{Grid,y}$	the baseline emission due to use of grid electricity in year Y,
$Q_{Elec.y,}$	quantity of electricity displaced in year Y,
$EF_{Grid,Y}$	emission coefficient of northern grid in year Y.

Step 4: Calculation of project emission

$PE_y = Q_{Elec.\ aux.,\ y} * EF_{Grid,Y}$

Where,

PE_y	the project emission due to use of grid electricity in year Y,
$Q_{Elec.\ aux.,\ y}$	the amount of electricity consumed extra due to project activity,
$EF_{Grid,Y}$	emission coefficient of northern grid in year Y.

Step 5: Calculation of emission reduction

$ER_y = BE_y – PE_y$

Where,

ER_y	the emission reduction due to project activity in year Y,
BE_y	the baseline emission in year Y,
PE_y	the project emission due to use of grid electricity in year Y.

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

(Copy this table for each data and parameter)

Data / Parameter:	**Electricity**
Data unit:	MWh
Description:	Electricity saving due to project activity
Source of data used:	Plant records
Value applied:	3783
Justification of the	The used data is from plant records.

choice of data or description of measurement methods and procedures actually applied :	
Any comment:	--

Data / Parameter:	CO_2 Emission Factor
Data unit:	t CO_2/MWh
Description:	Carbon Emission Factor
Source of data used:	Central Electricity Authority
Value applied:	0.81
Justification of the choice of data or description of measurement methods and procedures actually applied :	The used data is from an official source.
Any comment:	--

Data / Parameter:	Volume
Data unit:	Litre
Description:	Saving in FO Consumption
Source of data used:	Plant records
Value applied:	--
Justification of the choice of data or description of measurement methods and procedures actually applied :	The used data is from plant records.
Any comment:	--

Data / Parameter:	Electricity
Data unit:	MWh
Description:	Additional consumption of electricity due to project activity
Source of data used:	Plant records
Value applied:	--
Justification of the choice of data or description of measurement methods and procedures actually applied :	The used data is from plant records.
Any comment:	--

B.6.3 Ex-ante calculation of emission reductions:

Year	Estimation of project activity emission (tonnes CO_2e /yr.)	Baseline emissions (tonnes CO_2e /yr.)	Estimation of leakage (tonnes CO_2e / yr.)	Estimation of emission reduction (tonnes CO_2e /yr.)
2008 – 09	0	3654	0	3654
2009 – 10	0	3654	0	3654
2010 – 11	0	3654	0	3654
2011 – 12	0	3654	0	3654
2012 – 13	0	3654	0	3654
2013 – 14	0	3654	0	3654
2014 – 15	0	3654	0	3654
2015 – 16	0	3654	0	3654
2016 – 17	0	3654	0	3654
2017 – 18	0	3654	0	3654
Total	**0**	**36540**	**0**	**36540**

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

The procedure followed for estimating the emissions reductions from this project activity during the crediting period are as per the following steps:

Step 1: Calculation of baseline emission

$BE_y = BE_{FO,y} + BE_{Grid,y}$

Step 2: Calculation of baseline emission due to FO

$BE_{FO,y} = HGy * EF_{FO, CO2}$

Step 3: Calculation of baseline emission due to electricity

$BE_{Grid,y} = Q_{Elec.y,} * EF_{Grid,Y}$

Step 4: Calculation of project emission

$PE_y = Q_{Elec. aux., y} * EF_{Grid,Y}$

Step 5: Calculation of emission reduction

$ER_y = BE_y – PE_y$

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

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)	
Data / Parameter:	**Electricity**
Data unit:	MWh
Description:	Electricity saved due to all activities
Source of data to be used:	Calculated from the plant records
Value of data	--
Description of measurement methods and procedures to be applied:	The value for all savings will be calculated from plant records. The data will be archived both in electronic and paper form for crediting period + 2 years.
QA/QC procedures to be applied:	--
Any comment:	--

Data / Parameter:	**Electricity Consumption**
Data unit:	MWh
Description:	Additional electricity consumed due to project activity
Source of data to be used:	Plant records
Value of data	--
Description of measurement methods and procedures to be applied:	Electric meter connected to different machines and instrument in the project boundary will record the consumption data. The data will be archived in both electronic and paper form for crediting period + 2 years.
QA/QC procedures to be applied:	--
Any comment:	--

Data / Parameter:	Volume
Data unit:	Litre
Description:	Saving in FO Consumption
Source of data to be used:	Plant records
Value of data	--
Description of measurement methods and procedures to be applied:	The data will be archived in both electronic and paper form for crediting period + 2 years.
QA/QC procedures to be applied:	--
Any comment:	--

Data / Parameter:	Volume
Data unit:	M^3
Description:	Quantity of waste gas
Source of data to be used:	Calculated from Plant records

Value of data	--
Description of measurement methods and procedures to be applied:	The data will be archived in both electronic and paper form for crediting period + 2 years.
QA/QC procedures to be applied:	--
Any comment:	--

B.7.2 Description of the monitoring plan:

As per the provisions of paragraph 14 of Draft simplified modalities and procedures for small scale COM project activities [FCCC/CP/2002/7/Add.3, English, Page 21] the "Project participants may use the simplified baseline and monitoring methodologies specified in appendix B for their project category" if they meet the applicability criteria of small scale COM project activity.

Since the project activity is a small-scale COM project of AMS III.Q. category, the monitoring methodology and plan has been developed in line with the guidance provided in paragraph 13 of category III.Q. for baseline emissions determination.

For baseline emissions determination, monitoring shall consist of:

(a) Metering the thermal and/or electrical energy produced. In case of thermal energy the enthalpy of the thermal energy output stream like hot water/steam should be monitored.

(b) Metering the amount of waste gas or the amount of energy contained in the waste heat or waste pressure.

As per para 14 "For project emissions determination, the Tool to calculate project or leakage CO_2 emissions from fuel combustion and the Tool to calculate project emissions from electricity consumption shall be used".

Thus as per the methodology, monitoring shall consist of:

1. Metering of electricity and FO saving after the project activity.
2. Monitoring and metering of auxiliary power consumption of project activity.
3. Computation of Emission Factor from published CEA database.

Monitoring plan:

A Monitoring & Verification (M&V) Plan has been developed by the project proponent for monitoring and verification of actual emission reductions. The Monitoring and Verification (M&V) procedures define a project-specific standard against which the project's performance (i.e. GHG reductions) and conformance with all relevant criteria will be monitored and verified.

The aim is to enable this project have a clear, credible, and accurate set of monitoring, evaluation and verification procedures. The purpose of these procedures would be to

direct and support continuous monitoring of project performance/key project indicator to determine project outcomes, greenhouse gas (GHG) emission reductions.

The project revenue (energy savings) is based on the quantum of heat recovered from the waste gas as compared to the baseline fossil fuel consumption before project activity implementation. The monitoring and verification system would mainly comprise of the electronic power (energy) meters, furnace oil flow meters, steam flow meters, installed at the each project activity site in order to measure the quanity of 'waste heat recovered' after project implementation.

The above meters used for monitoring of the project activity will comprise microprocessor-based instruments of reputed make with desired level of accuracy. All instruments will be calibrated and marked at regular intervals so that the accuracy of measurement can be ensured all the time.

Monitoring Approach

The general monitoring principles are based on:

1. Frequency
2. Reliability
3. Registration and reporting
4. Frequency of monitoring

The project proponent will install power meters, steam flow meters and furnace oil flow meters to monitor and record the 'energy use' data for the all the poject activity sites on a continuous basis.

Reliability

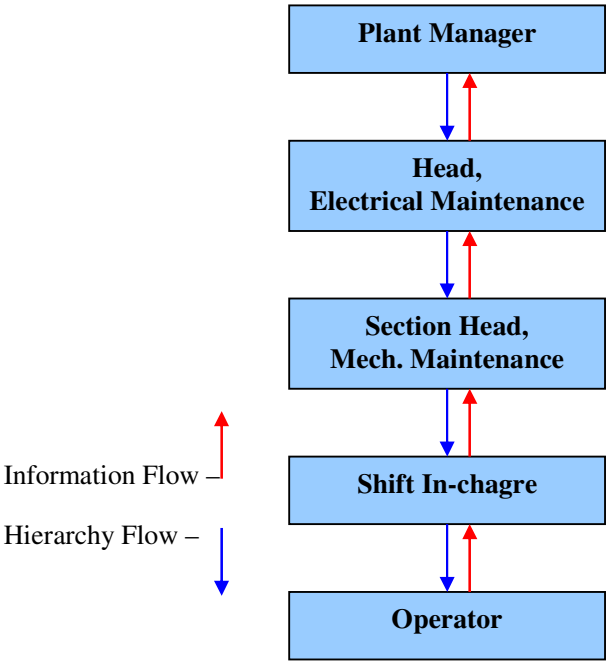
All measurement devices will be of microprocessor based with best accuracy and procured from reputed manufacturers. Since the reliability of the monitoring system is governed by the accuracy of the measurement system and the quality of the equipment to produce the results all power measuring instruments would be calibrated once a year for ensuring reliability of the system. All instruments will carry tag plates, which indicate the date of calibration and the date of next calibration. Therefore the system ensures the final energy use data is highly reliable.

Registration and reporting

Registration of data is captured manually through logging the energy meter reading in log books in hard copy as well as there will be logging in soft copy also. Daily, weekly and monthly reports will be prepared stating the cumulative energy use. Based on the monitored data and the IPCC emission factors, the baseline emissions and project activity emissions will be calculated.

There is no technology transfer in the project activity therefore the project activity doesn't lead to any leakage emissions. The difference between the baseline and project emissions is reported as emission reduction from the project activity.

Emission monitoring and calculation procedure will follow the following organisational structure.



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

Date of completion of baseline and monitoring methodology – 12/01/2008

Name of the responsible person –

Asahi India Glass Ltd. has developed the baseline and monitoring methodology along with their consultants, MITCON Consultancy Services Ltd.. Details are provided in Annex – I of the document.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1 Starting date of the project activity:

07/11/2005 (Purchase order for VAM)

C.1.2 Expected operational lifetime of the project activity:

20 Years

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

C.2.1 Renewable crediting period

Not Opted for.

C.2.1.1 Starting date of the first crediting period:

Not applicable

C.2.1.2 Length of the first crediting period:

Not applicable

C.2.2 Fixed crediting period:

Opted for.

C.2.2.1 Starting date:

15/06/2008 or date of registration with CDM EB, whichever is later.

C.2.2.2 Length:

10 years.

SECTION D. Environmental impacts

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

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

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

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

The project activities do not require an environmental impact assessment (EIA) under Indian law.

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

The project is an environmentally friendly project as it improves the environmental condition in the surroundings by reducing the temperature of flue gas exhausted in to the atmosphere.

Report on Environmental Impact

The impact of the project on the environment occurs during two stages:

- Construction phase
- Operational phase

Impacts during construction phase

The impacts due to the construction of the project activity are very negligible as it would only involve installation of equipments such as pumps and pipings with insulation systems. Laying of with insulation pipeline would cause air pollution which would be usually short-term and would cease to exist beyond the construction phase.

Impacts during operational phase

The operational phase of the project activity involves heat recovery from waste flue gas which was otherwise exhausted to atmosphere. There is no addition in the environmental impacts to the surroundings.

Project proponent has installed safety devices and implemented the environmental management system (EMS) as per ISO 14001 for this Waste Heat Recovery project. The environmental management plan (EMP) consists of measures to mitigate such emissions arising from normal, abnormal and emergency conditions.

SECTION E. Stakeholders' comments

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

The project activity will be executed and operated within the existing operational plant. There are well established procedures within the company for involving technical as well as operating staff in the decision making for implementation of any project. AIS identified plant personnel working at all level and vendors as stakeholder in the project. An internal note was circulated to all identified stakeholders through all departments within the plant concerned with the area of project activity. A project description and a feed back form were also attached with the internal note for stakeholder's consultation. All stakeholders were asked to provide their response through feed back form. All identified stakeholder are listed as follows:

Sr. No.	Name	Department / Designation
1	Praveen Kumar	HR & Administration
2	Maha Singh	Pradhan
3	Ramesh Chouhan	Cashier
4	Mandroop Singh	Secretary
5	Ajay Bangroo	Production
6	Maneet Singh	Production
7	Ajai Kumar	Production
8	Manoj Kumar Singh	Maintenance
9	Rajesh Dahiya	Production (S/A)
10	Krishan Kumar	Production
11	Himanshu Sharma	TPM
12	Rupak Malik	Mechanical
13	Sunil Singh	Manufacturing
14	Rohit Gupta	Bussiness Development
15	Sanjeev Kumar	Electrical Maintenance
16	Manish Jain	Electrical Maintenance
17	Bhagirathmal	Electrical
18	Pawan Anand	Corporate Supply Chain
19	Mukesh Singh	Production T1 & T2
20	Gaurav Gupta	Bussiness Development
21	Pradeep Sharma	SCM
22	Mohit Jain	Accounts
23	Brijesh Gupta	Electrical
24	Amit Kumar	Electrical
25	Sanjeev Trehan	IT

E.2 Summary of the comments received:

There are no negative impacts of the project in any way on any stakeholder. In fact, stakeholders appreciated the efforts towards energy conservation and the environmental benefits that the project activity has resulted into. The comments from internal stakeholder's viz. contract personnel, operators and supervisors were sought for the project. The summaries of comments made by stakeholders are as follows:

Almost all of the project stakeholders have recommended the project activity as a great initiative considering the gravity of environmental issues.

No negative comments were made for the project.

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

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

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Asahi India Glass Limited
Street/P.O.Box:	Village – Jaliawas, Tehsil – Bawal
Building:	Plant – 1, 94.4 Kms, National Highway – 8
City:	Rewari
State/Region:	Haryana
Postfix/ZIP:	123 501
Country:	India
Telephone:	+ 91-1284 - 264366-67, 264274, 264306
FAX:	+ 91-1284 - 264185
E-Mail:	--
URL:	www.asahiindia.com
Represented by:	
Title:	Departmental Head
Salutation:	Mr.
Last Name:	Arora
Middle Name:	--
First Name:	Vijay
Department:	Electrical Maintenance
Mobile:	+91 9315363000
Direct FAX:	-----
Direct tel:	--
Personal E-Mail:	vijay.arora@aisglass.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

Detail of the energy and emission baseline has been developed using the baseline methodology prescribed by the UNFCCC in Appendix B to Simplified M&P for small scale COM projects activities belonging to AMS III.Q.
As per para 9 of AMS III.Q "*For computing the emissions in the baseline the procedure provided in paragraphs 6 to 13 of AMS I.C shall be used*".

From paragraphs 6 to 13 of AMS I.C paragraph 10 is applicable for this project which is as follows:

10. For steam/heat produced using fossil fuels the baseline emissions are calculated as follows:

$$BEy = HGy * EF\ CO_2 / \eta_{th}$$

Where:

BEy the baseline emissions from steam/heat displaced by the project activity during the year y in tCO2e.
HGy the net quantity of steam/heat supplied by the project activity during the year y in TJ.
$EFCO_2$ the CO2 emission factor per unit of energy of the fuel that would have been used in the baseline plant in (tCO2 / TJ), obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used.
η_{th} the efficiency of the plant using fossil fuel that would have been used in the absence of the project activity.

Step I: Determination of Energy Baseline

In the absence of the project activity, the existing furnace oil fired units and electricity consumption from the grid would have continued over the entire crediting period. Therefore, the energy baseline would be the furnace oil consumption of thermic fluid heaters and electricity consumption from the grid equivalent to power saving by the Waste Heat Recovery. Thus, the energy sources primarily include furnace oil and electricity consumption. The base line data (two years data of the years prior to project implementation) has been used to determine the energy baseline.

Step II: Determination of carbon intensity of the chosen baseline

As stated above, there are three energy sources

- Electrical energy drawn from Northern Region Grid and produced in FO based CPP
- Thermal energy generated from furnace oil combustion for steam boilers and

The emission coefficient for each of these sources has been determined herein:

(A) Emission Coefficient of the Northern Regional Grid

In the proposed baseline, Northern Region grid is used as the reference region for estimating the current generation mix. Using the methodology available for small-scale project activities, the weighted average emissions (t CO_2 e/GWh) of current generation mix of Northern Region grid of India is used for the calculation of baseline. The weighted average emission factor data calculated and provided by Central Electricity Authority (CEA)[3] is used for the proposed project activity.

(B) Emission Coefficient for Furnace Oil (FO)

The emission coefficient is based on NCV and Emission Factor

As per the provisions of paragraph 59 of Appendix B of Simplified Modalities and Procedures for Small Scale COM Project Activities [FCCC/CP/2002/7/Add.3, English, Page 21], the emission coefficient (measured in kg of CO_2 / kg of Furnace Oil) for the furnace oil reduced had been calculated in accordance with the IPCC default values as well as the laboratory analysis and stoichiometric analysis.

Emission Factors

The emission factors are based on IPCC Guidelines for National Greenhouse Gas Inventories and are given below.

Fuel	Emission Factor (kg CO_2/TJ)[3]	Emission factor (kg CO_2/kg)[4]	Calorific Value (TJ/Gg)[5]
Residual Fuel Oil (Furnace Oil)	77400	3.13	40.40

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

Annex 4

MONITORING INFORMATION

Monitoring information has been detailed in the section B.7