Bilateral Offset Credit Mechanism Proposed Methodology Form

Cover sheet of the Proposed Methodology Form

Form for submitting the proposed methodology

Host Country	Bangladesh
Name of the methodology proponents submitting this form	PEAR Carbon Offset Initiative, Ltd.
Sectoral scope(s) to which the Proposed Methodology applies	Waste energy recovery
Title of the proposed methodology, and version number	Title: Waste Heat Recovery and Utilization in Textile and Garment Factory Version number: 01.0
List of documents to be attached to this form (please check):	☐ The attached draft BOCM-PDD: ☐ Additional information
Date of completion	5 January 2015

History of the proposed methodology

Version	Date	Contents revised
01.0	5 January 2015	

A. Title of the methodology

Waste Heat Recovery and Utilization in Textile and Garment Factory

B. Terms and definitions

Terms	Definitions
Textile dyeing and finishing	The procedures from fabric pre-treatment to finishing in textile and garment dyeing houses. Including main procedures of fabric pre-treatment, dyeing and finishing (washing, drying) that is the chemical and physical treatments of consuming heat and steam.

Waste heat	Heat energy of boiler exhaust and/or waste water from dyeing machines

C. Summary of the methodology

Items	Summary
GHG emission reduction measures	Recovered waste heats are used for preheating feed-water to boilers and dyeing machines so that reduce fuel consumption of boilers that provide steam for dyeing and finishing process.
Calculation of reference emissions	Reference emission is calculated based on the amount of waste energy/heat utilized, boiler efficiency and CO2 emission factor of the fossil fuel that is used for providing energy to the dyeing process. Conservative values of the parameters are used to ensure the reference emission is lower than BaU emission.
Calculation of project emissions	The project emission is calculated based on the electricity consumption of waste heat recovery system and CO2 emission factor of electricity.
Monitoring parameters	The following parameters need to be monitored. The temperature and amount of feed-water for boiler and/or dyeing machines in the project. The temperature of feed-water for boiler and dyeing machines in the case of without project. The amount of electricity consumed by the waste heat recovery system.

D. Eligibility criteria

This methodology is applicable to projects that satisfy all of the following criteria.

Criterion 1	Waste heat (heat from dyeing waste water) recovery from dyeing and finishing process in the existing or new textile and garment factories.
Criterion 2	Spiral heat exchanger without distance pieces is applied for heat recovery.
Criterion 3	Targeting factories with dyeing capacity more than 10 ton/day

E. Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Fossil fuel consumption for providing the same amount of energy (steam and heat) utilized from waste heat recovery	CO_2
Project emissions	
Emission sources	GHG types
Electricity consumption by the waste heat recovery system	CO_2

F. Establishment and calculation of reference emissions

F.1. Establishment of reference emissions

The reference emission is the emission from consumption of fossil fuel to gain the same amount of energy utilized from waste heat recovery system.

F.2. Calculation of reference emissions

$$RE_y = (T_P - T_{Re}) \times W_{th} \times F_w \times \frac{1}{Ef} \times EF_{CO2,fuel} \times 10^{-6}$$

RE_y: Reference emission [tCO_2/y]

T_P: Temperature of feed-water in the project [°C]

T_{Re}: Temperature of feed-water in the case of without the project [°C]

W_{th}: The specific heat of water [kJ/kg. °C]

F_w: The amount of the feed-water in the project [t/y]

Ef: Boiler efficiency [ratio]

$EF_{CO2,fuel}$: CO_2 emission factor the fossil fuel that is used to provide energy for dyeing and finishing process [tCO_2/TJ]

G. Calculation of project emissions

Project emission is calculated based on the amount of electricity consumed by the waste heat

recovery system and electricity CO_2 emission factor.

$PE_y = EC_{PJ,y} \times EF_{elec}$

PE_y : Project emissions [tCO_2/y]

$EC_{PJ,y}$: Electricity consumption by the waste heat recovery system [MWh/y]

EF_{elec} : CO_2 emission factor of electricity [tCO_2/MWh]

H. Calculation of emissions reductions

$ER_y = RE_y - PE_y$

ER_y: Emission Reductions [tCO_2/y]

RE_y: Reference emissions [tCO_2/y]

PE_y: Project emissions [tCO_2/y]

I. Data and parameters fixed *ex ante*

The source of each data and parameter fixed *ex ante* is listed as below.

Parameter	Description of data	Source
Ef	Boiler efficiency	Maximum boiler efficiency 1.0 is used for conservativeness
$EF_{CO2,fuel}$	CO_2 emission factor of the fuel used for steam generation Natural gas：54.3 t CO_2/TJ (54.3–58.3)	2006 IPCC Guidelines for National Greenhouse Gas Inventories. Table 1.4, Chapter 1, Volume 2.
EF_{elec}	CO_2 emission factor of electricity：0.8 tCO_2/MWh (Diesel captive power generation)	Emission factor of diesel captive power is used for the conservativeness (Table I.F.1, Small Scale CDM Methodology: AMS I.F., Ver.2) Emission factor of the grid is 0.67 tCO_2/MWh (Official data of Bangladesh Government).