Joint Crediting Mechanism Approved Methodology ID_AM001

"Power Generation by Waste Heat Recovery in Cement Industry"

A. Title of the methodology

Power Generation by Waste Heat Recovery in Cement Industry

B. Terms and definitions

Terms	Definitions
Waste heat	Heat generated from cement production facility which would not have been recovered in the absence of the project.
Suspension Preheater boiler (SP boiler)	Boiler which recovers waste heat from a suspension preheater, which pre-heats raw materials fed into a rotary kiln, to generate steam.
Air Quenching Cooler boiler (AQC boiler)	Boiler which recovers waste heat from an air quenching cooler to generate steam.
Waste Heat Recovery system (WHR system)	Power generation system consisting of a SP boiler and/or AQC boiler, turbine generator and cooling tower that utilizes waste heat from cement production facility.

C. Summary of the methodology

Items	Summary
GHG emission reduction measures	Waste heat recovery (WHR) system which generates electricity through waste heat recovered from cement production facility. Electricity generated from the WHR system replaces grid electricity resulting in GHG emission reductions of the connected grid system.
Calculation of reference emissions	Reference emissions are calculated from net electricity generation by the project which replaces grid electricity import to the cement factory where the project is implemented during a given time period.
Calculation of project	Project emissions are not considered as the WHR system does

emissions	not utilize any fossil fuel.
Monitoring parameters	The quantity of the electricity supplied from the WHR system to the cement production facility is monitored.

D. Eligibility criteria

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

Criterion 1	The project utilizes waste heat from the cement production facility by waste heat recovery (WHR) system to generate electricity.
Criterion 2	WHR system consists of a Suspension Preheater boiler (SP boiler) and/or Air Quenching Cooler boiler (AQC boiler), turbine generator and cooling tower.
Criterion 3	WHR system utilizes only waste heat and does not utilize fossil fuels as a heat source to generate steam for power generation.
Criterion 4	WHR system has not been introduced to a corresponding cement kiln of the project prior to its implementation.
Criterion 5	The cement factory where the project is implemented is connected to a grid system and the theoretical maximum electricity output of the WHR system, which is calculated by multiplying maximum electricity output of the WHR system by the maximum hours per year (24 * 365 = 8,760 hours), is not greater than the annual amount of the electricity imported to the cement factory from the grid system: ➢ During the previous year before the validation, if the validation of the project is conducted before the operation of the project, or ➢ During the previous year before the operation of the project, if the validation of the project is conducted after the operation of the project.
Criterion 6	The WHR system is designed to be connected only to an internal power grid of the cement factory.

E. Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Grid electricity generation	CO_2
Project emissions	

Emission sources	GHG types
N/A	N/A

F. Establishment and calculation of reference emissions

F.1. Establishment of reference emissions

Reference emissions are calculated on the basis of net electricity generation by the project that replaces the import of grid electricity to the cement factory where the project is implemented.

The quantity of electricity consumed by the WHR system except for direct captive use of the electricity generated by itself is subtracted from the quantity of the electricity supplied from the WHR system to the cement production facility to calculate net electricity generation.

In order to ensure conservativeness, the quantity of electricity consumption by the WHR system except for the direct captive use of the electricity generated by itself, is calculated by using the theoretically maximum load for the capacity of equipments in the above-mentioned WHR system.

F.2. Calculation of reference emissions

$RE_p = EG_p * EF_{grid}$

Where,

RE_p	Reference emissions during a given time period p	(tCO_2/p)
EG_p	The quantity of net electricity generation by the WHR system which replaces grid electricity import during a given time period p	(MWh/p)
EF_{grid}	CO_2 emission factor for an Indonesian regional grid system, from which electricity is displaced due to the project during a given time period p	(tCO_2/MWh)

Determination of EG_p

$EG_p = EG_{SUP,p} - EC_{AUX,p}$

$EG_{SUP,p}$	The quantity of the electricity supplied from the WHR system to the cement production facility during a given time period p	(MWh/p)
$EC_{AUX,p}$	The quantity of electricity consumption by the WHR system except	(MWh/p)

	for the direct captive use of the electricity generated by itself during a given time period *p*	

Determination of $EC_{AUX,p}$

$EC_{AUX,p} = EC_{CAP} * 24(hours/day) * D_p$

EC_{CAP}	The total maximum rated capacity of equipments of the WHR system which consumes electricity except for the capacity of equipments which use the electricity generated by itself directly	(MW)
D_p	The number of days during a given time period *p*	(day/p)

G. Calculation of project emissions

Project emissions are not assumed in the methodology as the WHR system utilizes only waste heat and does not utilize fossil fuels as heat source to generate steam for power generation, which is prescribed in the eligibility criteria 3.
Therefore, the following formula is used to express the project emissions:

$PE_p = 0$

H. Calculation of emissions reductions

Emission reductions are calculated as the difference between the reference emissions and project emissions, as follows:

$ER_p = RE_p - PE_p$

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_{grid}	CO_2 emission factor for an Indonesian regional grid system, from which electricity is displaced due to the project	The most recent value available at the time of validation is applied and fixed for the monitoring period thereafter. The data is sourced from "Emission Factors of Electricity

	during a given time period	Interconnection Systems", National Committee on Clean Development Mechanism Indonesian DNA for CDM unless otherwise instructed by the Joint Committee.
EC_{CAP}	The total maximum rated capacity of equipments of the WHR system which consumes electricity except for the capacity of equipments which use the electricity generated by itself directly	Rated capacity of all installed equipments of the WHR system which consumes electricity except for the capacity of equipments which use the electricity generated by itself directly

History of the document

Version	Date	Contents revised
01.0	19 May 2014	JC2, Annex 1 Initial approval.