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### JCM Proposed Methodology Form

#### Cover sheet of the Proposed Methodology Form

Form for submitting the proposed methodology

Host Country	Indonesia
Name of the methodology proponents submitting this form	Mitsubishi UFJ Morgan Stanley Securities Co., Ltd.
Sectoral scope(s) to which the Proposed Methodology applies	1
Title of the proposed methodology, and version number	Title: Power Generation by Waste Heat Recovery in Glass Production Facility Version number: 01.1
List of documents to be attached to this form (please check):	<input type="checkbox"/> The attached draft JCM-PDD: <input type="checkbox"/> Additional information
Date of completion	2 March 2015

History of the proposed methodology

Version	Date	Contents revised
01.0	9 October 2014	Initial draft
01.1	13 January 2015	Second draft
01.2	2 March 2015	Third Draft

## A. Title of the methodology

Power Generation by Waste Heat Recovery in Glass Production Facility

## B. Terms and definitions

Terms	Definitions
Waste heat	Heat generated from glass production facility which would not have been recovered in the absence of the project
Waste Heat Recovery system (WHR system)	The power generation system consists of heat recovery unit and power generation unit.

## C. Summary of the methodology

Items	Summary
<i>GHG emission reduction measures</i>	Waste heat recovery (WHR) system which generates electricity through waste heat recovered from glass production facility. Electricity generated from the WHR system replaces grid electricity resulting in GHG emission reductions of the connected grid system.
<i>Calculation of reference emissions</i>	Reference emissions are calculated from net electricity generation by the project which replaces grid electricity import to the glass factory where the project is implemented during a given time period.
<i>Calculation of project emissions</i>	Project emissions are not considered as the WHR system does not utilize any fossil fuel
<i>Monitoring parameters</i>	The quantity of the electricity supplied from the WHR system to the glass 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 of temperature ranging from 300 to 500 degrees Celsius from the flat glass production facility by waste heat recovery (WHR) system to generate electricity.
Criterion 2	WHR system consists of thermal oil boiler and power generation unit.
Criterion 3	WHR system utilizes only waste heat and does not utilize fossil fuels as a heat source to generate power.
Criterion 4	The glass 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 glass factory from the grid system: (1) During the previous year before the validation, if the validation of the project is conducted before the operation of the project, or (2) 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 5	The WHR system is designed to be connected only to an internal power grid of the glass factory.
Criterion 6	In case working fluid containing greenhouse gas is utilized in the WHR system, the structure of the WHR system prevents leakage of such gas from the system.

## E. Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Grid electricity generation	CO2
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 glass 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 glass 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

$$RE_p = EG_p \times EF_{grid}$$

Where,

$RE_p$	Reference emissions during a given time period p	(tCO <sub>2</sub> /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 <sub>2</sub> emission factor for an Indonesian regional grid system, from which electricity is displaced due to the project during a given time period p	(tCO <sub>2</sub> /MWh)

### Determination of EG<sub>p</sub>

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

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

### Determination of $EC_{AUX, p}$

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

$EC_{CAP}$	The total maximum rated capacity of equipments of the WHR (MW) system which consumes electricity except for the capacity of equipments which use the electricity generated by itself directly
$D_p$	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
$EF_{grid}$	CO2 emission factor for an Indonesian regional grid system, from which electricity is displaced due to the project during a given time period	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 Interconnection Systems”, National Committee

		on National Council on Climate Change unless otherwise instructed by the Joint Committee.
<i>EC</i> <sub><i>CAP</i></sub>	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.