JCM Proposed Methodology Form

Cover sheet of the Proposed Methodology Form

Form for submitting the proposed methodology

Host Country	Vietnam
Name of the methodology proponents submitting this form	Mitsubishi Electric Corporation Mitsubishi Corporation Mitsubishi UFJ Morgan Stanley Securities Co., Ltd.
Sectoral scope(s) to which the Proposed Methodology applies	3. Energy demand
Title of the proposed methodology, and version number	Introduction of room air conditioners equipped with inverters to public sector buildings, Version 01.0
List of documents to be attached to this form (please check):	☐The attached draft JCM-PDD: ☒Additional information
Date of completion	27/11/2014

History of the proposed methodology

Version	Date	Contents revised
01.0	27/11/2014	First edition

A. Title of the methodology

Introduction of room air conditioners equipped with inverters to public sector buildings, Version 01.0

B. Terms and definitions

Terms	Definitions
Room air conditioner (RAC)	A single split type air conditioner.
Inverter	A device included in RACs and other motor-operated appliances, whose function is to vary the speed of the compressor motor in line with different load demand, to enable variable refrigerant flow to optimally regulate the temperature.
Public sector buildings	Buildings owned or administered by national or local government.
Energy efficiency ratio (EER)	The ratio of total cooling capacity to rated input power in specified conditions.
Cooling seasonal performance factor (CSPF)	Energy efficiency of RACs factoring into the seasonal temperature variation. Ratio of the total annual amount of heat that the RAC can remove from the indoor air when operated for cooling active mode to the total annual amount of energy consumed by the equipment during the same period.

C. Summary of the methodology

Items	Summary
GHG emission reduction measures	Energy saving achieved by introduction of RACs equipped with inverters to public sector buildings.
Calculation of reference emissions	GHG emissions associated with electricity consumption of reference RACs are calculated based on the monitored electricity consumption of project RACs, the ratio of the energy efficiency of reference and project RACs, and the CO_2 emission factor of the electricity consumed by project RACs.
Calculation of project emissions	GHG emissions associated with electricity consumption of project RACs are calculated based on the monitored electricity

	consumption of project RACs and the CO_2 emission factor of the electricity consumed by project RACs.
Monitoring parameters	Electricity consumption of project RACs Project energy efficiency (CSPF of project RACs) Reference energy efficiency (CSPF of reference RACs)

D. Eligibility criteria

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

Criterion 1	The project newly introduces RACs equipped with inverters, or replaces existing non-inverter RACs by inverter RACs.
Criterion 2	This methodology is applicable to public sector buildings.
Criterion 3	Rated cooling capacity of a project RAC is within the applicable range of the Vietnamese national standard TCVN7831:2012.
Criterion 4	Ozone Depletion Potential (ODP) of the refrigerant used for project RAC is zero.
Criterion 5	Plans to prevent release of refrigerants into the atmosphere at the time of RAC removal are prepared for both project RACs and the existing RACs replaced by the project. In the case of replacing existing RACs by project RACs, execution of the prevention plan is checked at the time of verification, in order to confirm that refrigerant used for the existing RACs removed by the project is not released to the air.

E. Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Electricity consumption by reference RACs	CO_2
Project emissions	
Emission sources	GHG types
Electricity consumption by project RACs	CO_2

F. Establishment and calculation of reference emissions

F.1. Establishment of reference emissions

Reference emissions are established as the product of monitored electricity consumption of project RACs, the ratio of the energy efficiency of reference and project RACs, and the CO_2 emission factor of the electricity consumed by project RACs.

The methodology provides following stepwise procedures to set energy efficiency values of the reference and project RACs, ex-post. In the procedures, reference RACs are conservatively set to results in a net reduction of emissions.

Step 1: Determine reference RACs that lead to net emission reduction

Select a reference RAC for each model of project RAC which meets the following conditions:

- Not equipped with inverters.
- Categorized as Grade 4 of the energy efficiency grades by EER as outlined in Table 3 of Vietnamese national standard TCVN7830.
- Cooling capacity of the reference RAC selected for the purpose of calculating reference emissions belongs to the same rated capacity class as the project RAC, based on the three rated capacity classes in Table 3 of TCVN7830.
- Reference RAC is previously unused and is currently available in the market at the time of CSPF determination.

Step 2: Determine CSPF of reference RACs

CSPF values of selected reference RACs by step 1 are determined at a third party testing facility which is equipped with a calorimeter capable of determining CSPF in line with ISO5151, following the testing procedures and conditions outlined in the Vietnamese National Standard TCVN 7831:2012.

Step 3: Determine CSPF of project RACs

CSPF values of project RACs are determined at a third party testing facility which is equipped with a calorimeter capable of determining CSPF in line with ISO5151, following the testing procedures and conditions outlined in the Vietnamese National Standard TCVN 7831:2012.

Step 4: Calculate ratio of CSPF of reference and project RACs for each model

For each model, divide the CSPF value of project RAC by the CSPF value of the relevant reference RAC.

Step 5: Select the reference and project energy efficiency (CSPF) values for the project

For a given group of RACs whose electricity consumption is measured together, select the CSPF values of the reference RAC and the project RAC calculated in Step 4 which yields the

lowest ratio (η_{PJ} / η_{REF} in equation 1) as the reference and project CSPF values for the project during the project life. This step ensures that ratio of CSPF values used for the purpose of calculating reference emissions is conservatively derived for the project.

F.2. Calculation of reference emissions

$$RE_p = \sum_{i=1}^{n} EC_{PJ,i,p} \times \left(\frac{\eta_{PJ}}{\eta_{REF}} \right) \times EF_{elec} \qquad (1)$$

Where

RE_p	=	Reference emissions during the period p [tCO_2/p]
$EC_{PJ,i,p}$	=	Electricity consumption by project RACs group i during the period p [MWh/p]
n	=	Number of RACs groups whose aggregate electricity consumption are measured by one electricity meter [dimensionless]
i	=	An index variable that is used to count the number of RACs groups
η_{PJ}	=	Energy efficiency (CSPF) of project RACs[1] [dimensionless]
η_{REF}	=	Energy efficiency (CSPF) of reference RACs[2] [dimensionless]
EF_{elec}	=	CO_2 emission factor of electricity consumed [tCO_2/MWh]

G. Calculation of project emissions

$$PE_p = \sum_{i=1}^{n} EC_{PJ,i,p} \times EF_{elec} \qquad (2)$$

Where

PE_p	=	Project emissions during the period p [tCO_2/p]
$EC_{PJ,i,p}$	=	Electricity consumption by surveyed project RACs group i during the period p [MWh/p]
EF_{elec}	=	CO_2 emission factor of electricity consumed [tCO_2/MWh]

[1] CSPF of the project RAC selected using steps as stipulated in Section F.1.
[2] CSPF of the reference RAC selected using steps as stipulated in Section F.1.

H. Calculation of emissions reductions

$$ER_p = RE_p - PE_p \quad (3)$$

Where

ER_p	=	Emission reductions during the period p [tCO_2/p]
RE_p	=	Reference emissions during the period p [tCO_2/p]
PE_p	=	Project emissions during the period p [tCO_2/p]

I. Data and parameters fixed *ex ante*

Parameter	Description of data	Source
EF_{elec}	CO_2 emission factor of electricity consumed. When captive power generation is not available at the project site, then the most recent Vietnamese national grid emission factor [EF_{grid}] available at the time of validation is applied as [EF_{elec}] and fixed for the monitoring period thereafter. When captive power generation is available at the project site, then [EF_{elec}] is conservatively selected as below and fixed for the monitoring period thereafter: EF_{elec} = min(EF_{grid}, $EF_{captive}$) $EF_{captive}$ = 0.8 tCO_2/MWh* *The most recent emission factor available from CDM approved small scale methodology AMS-I.A at the time of validation is applied.	[EF_{grid}] Ministry of Natural Resources and Environment of Vietnam (MONRE), Vietnamese DNA for CDM unless otherwise instructed by the Joint Committee. [$EF_{captive}$] CDM approved small scale methodology: AMS-I.A
n	Number of RACs groups whose aggregate electricity consumption are measured by one electricity meter [dimensionless]	The project proponent selects an integer between 1 and 25 in line with the number of RACs groups included in the project.