JCM methodology development
- Energy Efficiency Projects -

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Current progress of JCM methodologies

- **88 approved methodologies**
- **14 methodologies waiting for JC decisions**
- **20 methodologies under development**

List of approved methodologies in Mongolia

Methodology No.	Title	Date of approval
MN AM003	Installation of Solar PV System	30 Jan 17
MN AM002	Replacement and Installation of High Efficiency Heat Only Boiler (HOB) for Hot Water Supply Systems	28 Jan 15
MN AM001	Installation of energy-saving transmission lines in the Mongolian Grid	20 Feb 14

Number of approved methodologies by each country (as of 18 Jan 2021)

Indonesia	26
Viet Nam	15
Thailand	10
Myanmar	5
Cambodia	5
Mongolia	**3**
Costa Rica	3
Ethiopia	3
Laos	3
Bangladesh	3
Kenya	3
Chile	2
Philippines	2
Maldives	2
Saudi Arabia	1
Mexico	1
Palau	1

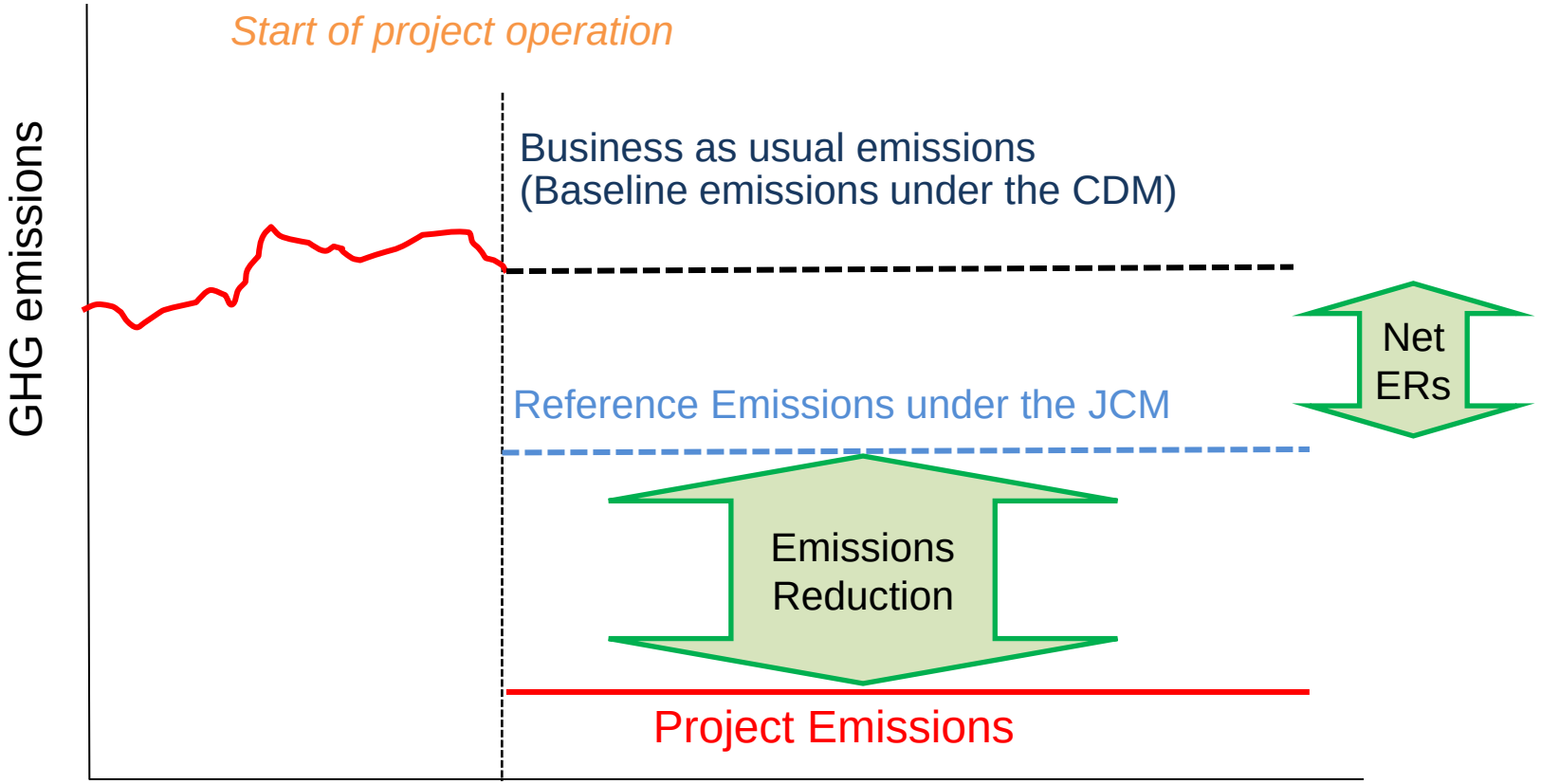
Methodology Development Procedure of the JCM

Steps	Details	Period
1. Methodology development	Methodology is developed by PP(s) and consultant.	6months to 1 year
2. Finalisation of methodology by Japanese side	The developed methodology is finalised by the Japanese side.	3-4weeks
3. Explanation to the Mongolian side	The draft methodology is explained to the Mongolian side.	In person or online meeting
4. Comments by the Mongolian side	Mongolian side makes comments on the methodology. The methodology might be revised based on the comments.	Within 3-4 weeks

Methodology Development Procedure of the JCM

Steps	Details	Period
5. Submission of Proposed Methodology	Proposed methodology is submitted by PP(s) to the secretariat.	
6. Completeness Check	The secretariat checks whether the proposed methodology is complete and communicates the results to the methodology proponents within 7 calendar days after the receipt of the submission.	dd/mm/yyyy ~ dd/mm/yyyy
7. Public inputs	The secretariat makes the methodology publicly available for public inputs through the JCM website. The duration of call for public inputs is 15 calendar days. The proposed methodology might be revised based on public inputs.	dd/mm/yyyy ~ dd/mm/yyyy
8. Approval of Proposed Methodology	The proposed methodology is approved by JC or electronic means.	dd/mm/yyyy

Basic Concept of JCM methodology

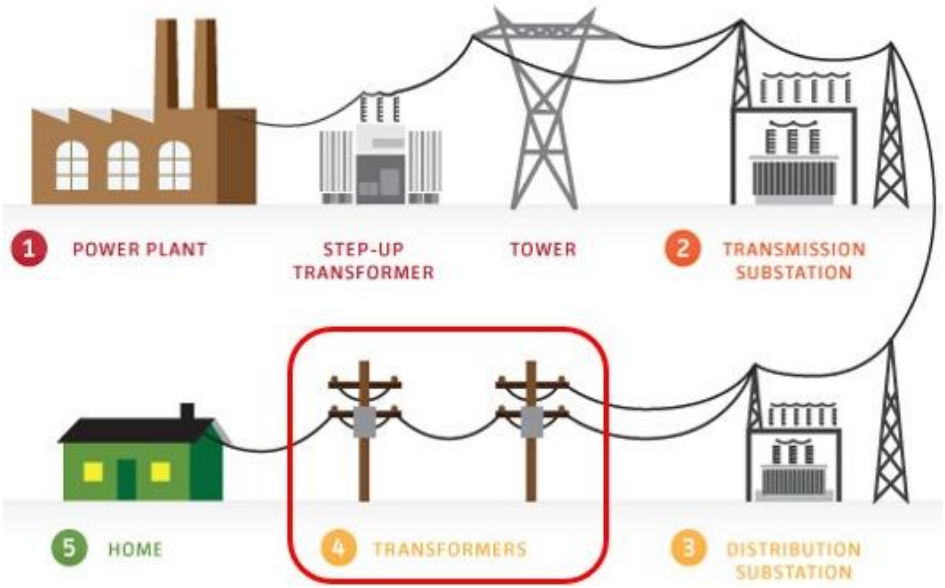


Case1:Installation of energy efficient transformers

Project Information

The purpose of this project is to reduce CO_2 emission through the promotion of amorphous high efficiency transformers in power distribution systems of Vietnam.

So far 3 project were registered under the JCM in Vietnam.
Expected ERs from those project are 7,620tCO_2/year.



Amorphous high Efficiency transformer

Source: GEC (http://gec.jp/jcm/projects/16pro_vie_03/)

Summary of the Methodology (Section C)

GHG emission reduction measures	Installation of energy efficient transformers (transformers with amorphous metal core) in a power distribution grid reduces no-load losses by transformers, which leads to reduction of losses for grid electricity, thus reduction of GHG emissions.
Calculation of reference emissions	Reference emissions are calculated by no-load losses of the reference transformer, blackout rate and CO_2 emission factor of the grid.
Calculation of project emissions	Project emissions are calculated by no-load losses of the project transformer, maximum allowable uncertainty for the no-load losses of the project transformer, blackout rate and CO_2 emission factor of the grid.
Monitoring parameters	Energizing time of the project transformer

Eligibility Criteria (Section D)

Criterion 1	Single-phase and/or three-phase oil-immersed transformer with amorphous metal core is installed in the distribution grid.
Criterion 2	Load losses of the project transformer determined in line with IEC 60076-1 or national/industrial standards complying with IEC 60076-1 is equal or smaller than the standard values or specification values of load loss, required by the power company of the grid where the project transformer is installed, corresponding to its capacity and number of phases.

Calculation of Reference Emissions (Section F)

$$RE_p = \sum_i \left(NLL_{RE,i,j,k} \times H_{i,p}\right) \times \left(1 - Br_p\right) \times EF_{grid} \times 10^{-6}$$

Where:

RE_p	: Reference emissions during the period p [tCO_2/p]
i	: Identification number of the reference transformer
j	: Identification number of the power company where the transformer i is installed
k	: Index which represents type of the reference transformer defined by its capacity and number of phases
$NLL_{RE,i,j,k}$	: No-load losses of the reference transformer i of capacity category k for the power company j [W]
$H_{i,p}$	: Energizing time of the project transformer i during the period p [hour/p]
Br_p	: Blackout rate during the period p [fraction]
EF_{grid}	: CO_2 emission factor of the grid [tCO_2/MWh]

Calculation of Project Emissions (Section G)

$$\mathrm{PE_p} = \sum_{\mathrm{i}} \left[\mathrm{NLL_{PJ,i,j,k}} \times (1 + \mathrm{UNC_i}) \times \mathrm{H_{i,p}}\right] \times \left(1 - \mathrm{Br_p}\right) \times \mathrm{EF_{grid}} \times 10^{-6}$$

Where:

PE_p	: Project emissions during the period p [tCO_2/p]
i	: Identification number of the project transformer
j	: Identification number of the power company where the transformer i is installed
k	: Index which represents type of the project transformer defined by its capacity and number of phases
$NLL_{PJ,i,j,k}$	: No-load losses of the project transformer i of capacity category k for the power company j [W]
UNC_i	: Maximum allowable uncertainty for the no-load losses of the project transformer i [fraction]
$H_{i,p}$	: Energizing time of the project transformer i during the period p [hour/p]
Br_p	: Blackout rate during the period p [fraction]
EF_{grid}	: CO_2 emission factor of the grid [tCO_2/MWh]

Calculation of Emission Reductions (Section H)

$$\mathrm{ER_p} = \mathrm{RE_p} - \mathrm{PE_p}$$

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]

How to achieve net emission reductions

- Reference emissions are mainly determined by no-load loss of the reference transformer, however, blackout rate also affects the calculation of reference emissions. To achieve net emission reductions, default value of blackout rate in Vietnam is set in a conservative manner.

No	Unit name	2012		2013		2014	
		SAIDI (min)	%	SAIDI (min)	%	SAIDI (min)	%
1	EVN NPC	9,005.0	1.71%	4,588.0	0.87%	4,130.0	0.79%
2	EVN CPC	7,540.0	1.43%	4,149.0	0.79%	3,182.0	0.61%
3	EVN SPC	7,047.0	1.34%	4,100.0	0.78%	2,576.0	0.49%
4	EVN HANOI	9,816.0	1.87%	3,995.0	0.76%	2,043.0	0.39%
5	EVN HCMC	2,988.0	0.57%	1,974.0	0.38%	1,286.0	0.24%
		Average	1.38%	Average	0.72%	Average	0.50%

Source: Additional information of VN_AM005 Ver1.0
https://www.jcm.go.jp/vn-jp/methodologies/24/attached_document1

Note: The System Average Interruption Duration Index (SAIDI) of five power companies have been collected for the past three years (2012, 2013 and 2014).

Monitoring Parameter

Monitoring Parameter during the project implementation

Table 1: Parameters to be monitored *ex post*

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Monitoring point No.	Parameters	Description of data	Estimated Values	Units	Monitoring option	Source of data	Measurement methods and procedures	Monitoring frequency	Other comments
N.A.	$H_{i,p}$	Energizing time of the project transformer *i* during the period *p*	-	hour/p	Option C	On-site measurements.	Counting the number of hours of this monitoring period	Once at the end of this monitoring period	Monitored values are input on "PMS(input_separate)" sheet

Table 2: Project-specific parameters to be fixed *ex ante*

(a)	(b)	(c)	(d)	(e)	(f)
Parameters	Description of data	Estimated Values	Units	Source of data	Other comments
$NLL_{RE,i,j,k}$	No-load losses of the reference transformer *i* of capacity category *k* for the power company *j*	-	W	The latest standard for no-load loss required by the power companies, or the specification value of no-load losses set by the power companies	Values are input on "PMS(input_separate)" sheet
$NLL_{PJ,i,j,k}$	No-load losses of the project transformer *i* of capacity category *k* for the power company *j*	-	W	Manufacturer's performance test report measured at the time of pre-delivery inspection	Values are input on "PMS(input_separate)" sheet
Br_p	Blackout rate during the period *p*	0.0187	fraction	Data obtained from power companies	
UNC_i	Maximum allowable uncertainty for the no-load losses of the project transformer *i*	-	fractoin	Manufacturer's performance test report measured at the time of pre-delivery inspection	Values are input on "PMS(input_separate)" sheet
EF_{grid}	CO_2 emission factor of the grid		tCO_2/MWh	Ministry of Natural Resources and Environment (MONRE), Vietnamese DNA for CDM unless otherwise instructed by the Joint Committee	

Default values set in advance
(No need to monitor during the project implementation)

Case2: Energy Saving by Introduction of High Efficiency Once-through Boiler

- This project contributes to the reduction of CO_2 emissions by introduction of high efficient once-through boiler with low air pollutant emission type at the instant noodle factory.

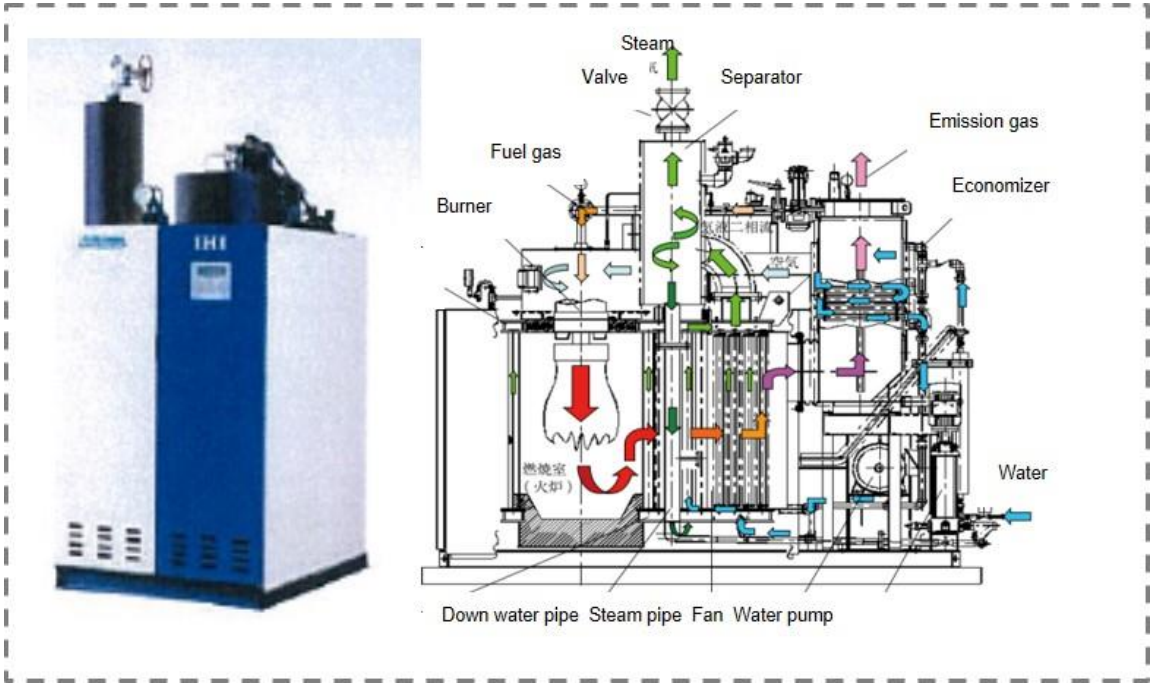
Project participants and their main role	Acecook Co.,Ltd. Project Management, Introducing Technology, Supporting MRV Methodology Proponent
	Acecook Myanmar Co.,Ltd. : - Installation of high efficient once-through boiler - Conducting MRV
Project site	Instant noodle factory of Acecook Myanmar Co.,Ltd. (Thilawa Special Economic Zone)
Estimated Emission Reductions	674 tCO_2/year

Source: GEC website, http://gec.jp/jcm/projects/16pro_mya_02/

Case2: Energy Saving by Introduction of High Efficiency Once-through Boiler

Project Information

A once-through boiler is a boiler without recirculation where water flows through the economizer, furnace wall, and evaporating and superheating tubes, sequentially. Once-through boiler is used to supply heat in factory and commercial facility.



Source: GEC website, http://gec.jp/jcm/projects/16pro_mya_02/

Summary of the Methodology (Section C)

GHG emission reduction measures	This methodology involves the installation of high efficiency once-through boiler. Compared with the water tube boilers and fire tube boilers which dominate Myanmar market, the efficiency of once-through boiler is higher and fuel consumption is less. Thus the introduction of once-through boiler will contribute to the GHG emission reductions.
Calculation of reference emissions	Reference emissions are calculated based on the efficiency of the boiler currently dominant in the Myanmar market. Conservative estimation of reference emissions is made by taking the following points into consideration: (i) lower CO_2 emission factor is selected from IPCC guideline with regard to the fuel used in reference boiler, and (ii) higher efficiency is applied for the reference boiler especially in low load range.
Calculation of project emissions	Project emissions are calculated on the basis of monitored fuel consumption and emission factor of the fuel of the project boiler
Monitoring parameters	The amount of fuel consumption

Eligibility Criteria (Section D)

MM_AM003 “Energy Saving by Introduction of High Efficiency Once-through Boiler

Criterion 1	The project boiler is a once-through boiler with a rated capacity of 7 ton/hour per unit or less (equivalent evaporation)
Criterion 2	Periodical check and maintenance by the manufacturer of boiler or authorized agent is implemented at least once a year.

Calculation of Reference Emissions (Section F)

$$\mathrm{RE_p} = \sum_i \sum_j \left(\mathrm{FC_{p,i,j,PJ}} \times \mathrm{NCV_{i,j,PJ}} \times \mathrm{EF_{RE}} \times \frac{\eta_{\mathrm{i,PJ}}}{\eta_{\mathrm{RE}}} \right)$$

Where:

RE_p	:Reference emissions during the period *p* [tCO_2/p]
$FC_{p,i,PJ}$	:The amount of fuel consumption of project boiler *i* for the fuel type *j* during the period p [mass or volume unit/p]
$NCV_{i,j,PJ}$	:Net calorific value of fuel used by project boiler *i* for the fuel type *j* [GJ/mass or volume unit]
EF_{RE}	:CO_2 emission factor of fuel used by reference boiler [tCO_2/GJ]
$\eta_{i,PJ}$	:Efficiency of project boiler *i* [dimensionless]
η_{RE}	:Efficiency of reference boiler [dimensionless]

Calculation of Project Emissions (Section G)

$$\mathrm{PE_p} = \sum_i \sum_j \left(\mathrm{FC_{p,i,j,PJ}} \times \mathrm{NCV_{i,j,PJ}} \times \mathrm{EF_{i,j,PJ}} \right)$$

Where:

PE_p	:Project emissions during the period p [tCO_2/p]
$FC_{p,i,PJ}$	:The amount of fuel consumption of project boiler i for the fuel type j during the period p [mass or volume unit]
$NCV_{i,j,PJ}$	:Net calorific value of fuel used by project boiler i for the fuel type j [GJ/mass or volume unit]
$EF_{i,j,PJ}$	:CO_2 emission factor of fuel used by project boiler i for the fuel type j [tCO_2/GJ]

Calculation of Emission Reductions (Section H)

$$\mathrm{ER_p} = \mathrm{RE_p} - \mathrm{PE_p}$$

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]

How to achieve net emission reductions

- In order to ensure net emission reductions, a higher efficiency of the reference boiler (89%) is adopted to calculate the reference emissions.

- In addition,

1) compared with reference boiler (oil and gas type), once-through boiler (project boiler, oil and gas type) can maintain high efficiency even at low load range, which improves the operating efficiency of project boiler, and

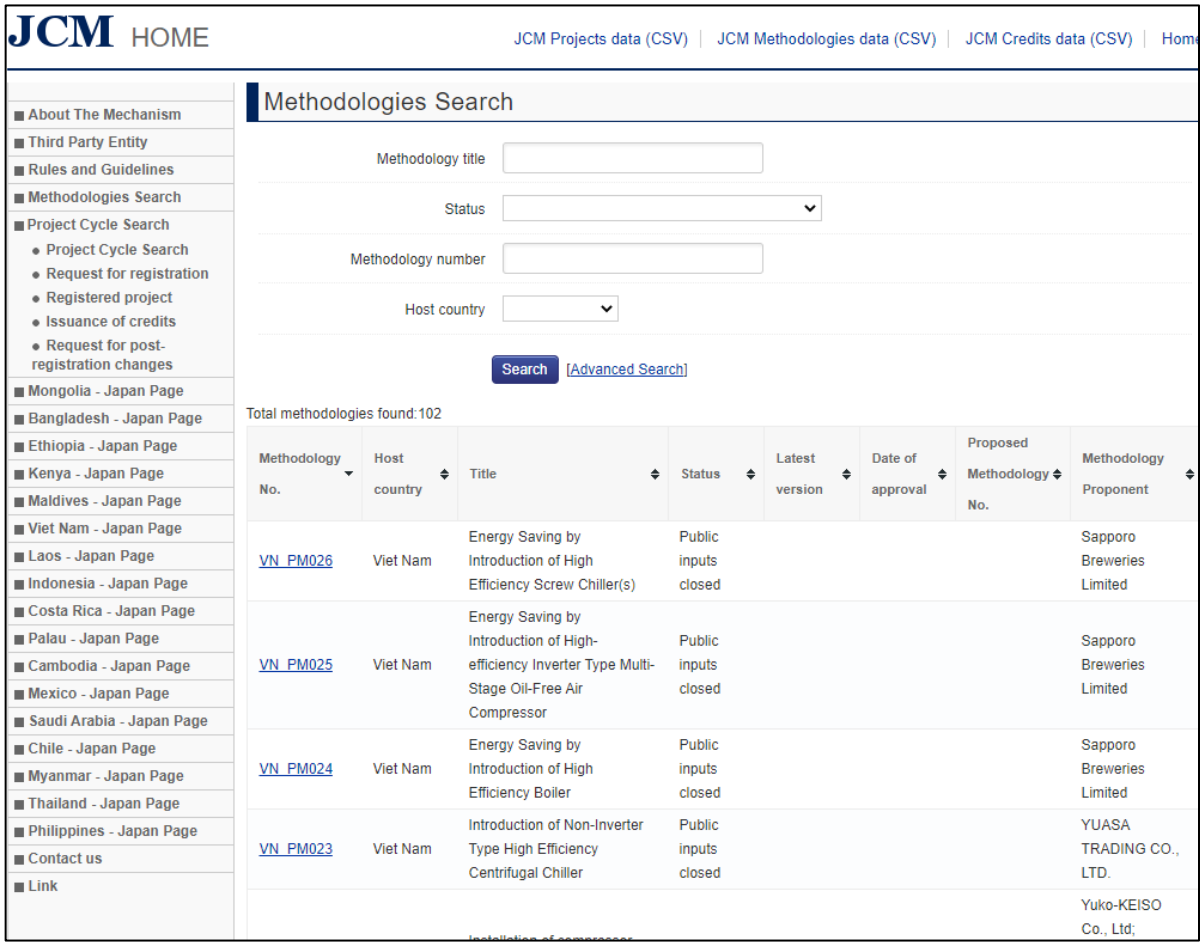
2) compared with reference boiler (coal), operational efficiency of the project boiler is higher due to better combustion control, which also ensures the net emission reductions.

- In addition, to calculate the reference emission conservatively, lower emission factor stated in 2006 IPCC guideline is adopted to secure the net emission reductions.

Monitoring Parameter

Parameter	Description of data	Measurement methods and procedures	Monitoring frequency
$FC_{p,i,j,PJ}$	Fuel consumption of project boiler i using the fuel type j (=natural gas or LPG) during the period p	[For Option B] Data is collected and recorded from invoices by fuel supply company. [For Option C] Data is measured by measuring equipments in the factory. - Specification of measuring equipments: 1) Fuel flow meter is applied for measurement of fuel consumption of the project boilers. 2) Data is measured by measuring equipment. The measuring equipment is replaced or calibrated at an interval following the regulations in the country in which the measuring equipment is commonly used or according to the manufacturer's recommendation, unless a type approval, manufacturer's specification, or certification issued by an entity accredited under international/national standards for the measuring equipment has been prepared by the time of installation. - Measuring and recording: 1) Measured data is automatically sent to a server where data is recorded and stored or recorded manually. 2) Recorded data is checked its integrity once a month by responsible staff.	Continuously
$FC_{p,i,j,PJ}$	Fuel consumption of project boiler i using the fuel type j (=diesel oil) during the period p		

JCM website: methodology information



Source: JCM website (https://www.jcm.go.jp/methodologies/all)