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Examples of MRV at Project Level: Efforts to Draft JCM Methodologies

Osamu Bannai, Ph.D
Programme Officer,
Carbon Management Department,
Global Environment Centre Foundation (GEC)

GEC

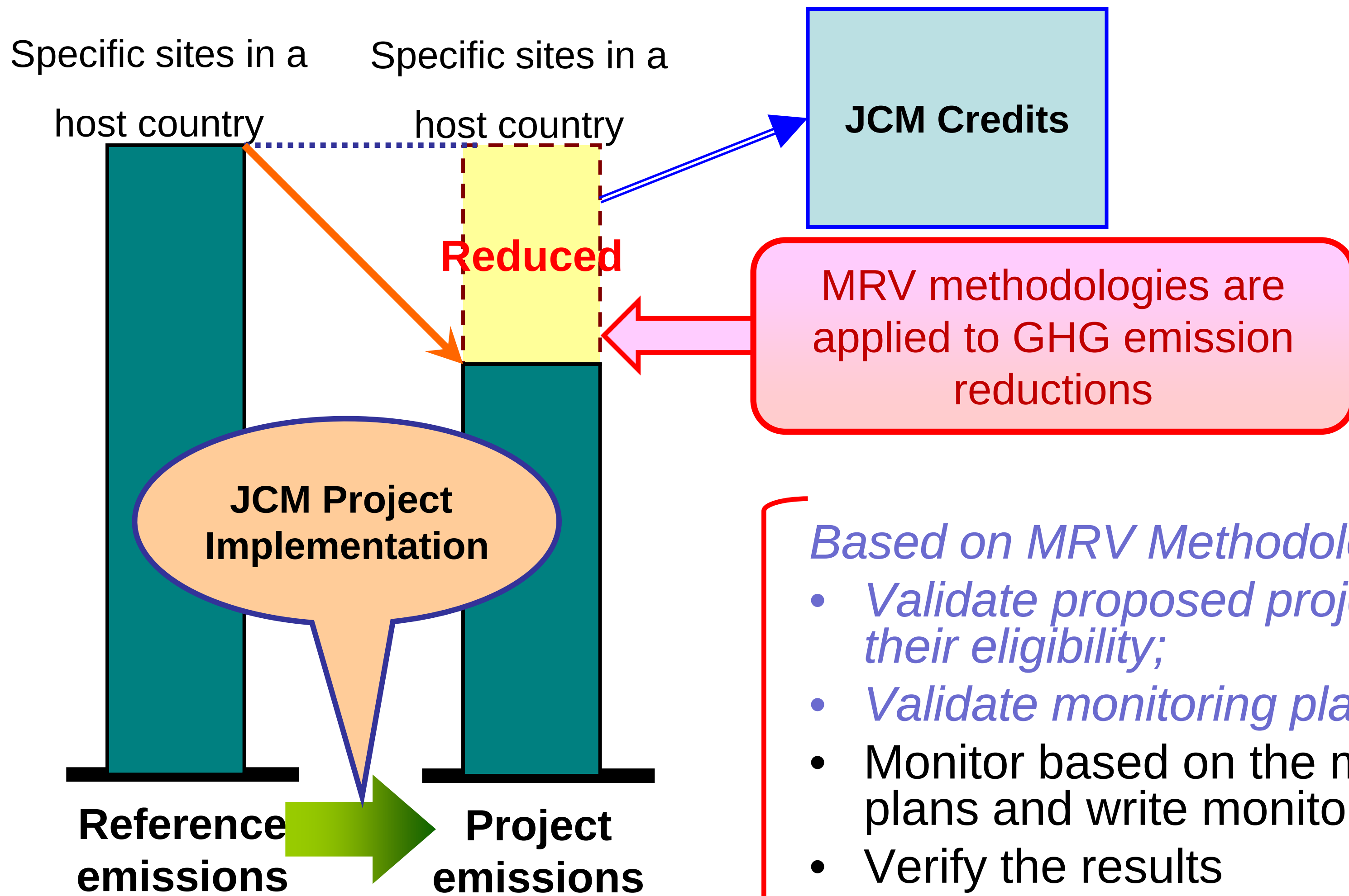
Outline

1. Joint Crediting Mechanism (JCM)
2. JCM Feasibility Study Programme
3. Examples of MRV methodologies from JCM FS programme
    1. Small-scale Biomass Power Generation with Stirling Engine in Cambodia
    2. Solar-Diesel Hybrid Power Generation to Stabilize Photovoltaic Power Generation in Indonesia
    3. Upgrading and Installation of High-Efficiency Heat Only Boilers (HOBs) in Mongolia

1. Joint Crediting Mechanism (JCM)

- Facilitating diffusion of leading low carbon technologies, products, systems, services, and infrastructure as well as implementation of mitigation actions, and contributing to sustainable development of developing countries.
- Appropriately evaluating contributions to GHG emission reductions or removals from Japan in a quantitative manner, by applying measurement, reporting and verification (MRV) methodologies, and use them to achieve Japan's emission reduction target.
- Contributing to the ultimate objective of the UNFCCC by facilitating global actions for GHG emission reductions or removals, complementing the CDM.
- As of July 2nd, five countries reached agreement upon JCM with Japanese Government.

JCM Projects & its MRV



Based on MRV Methodologies:

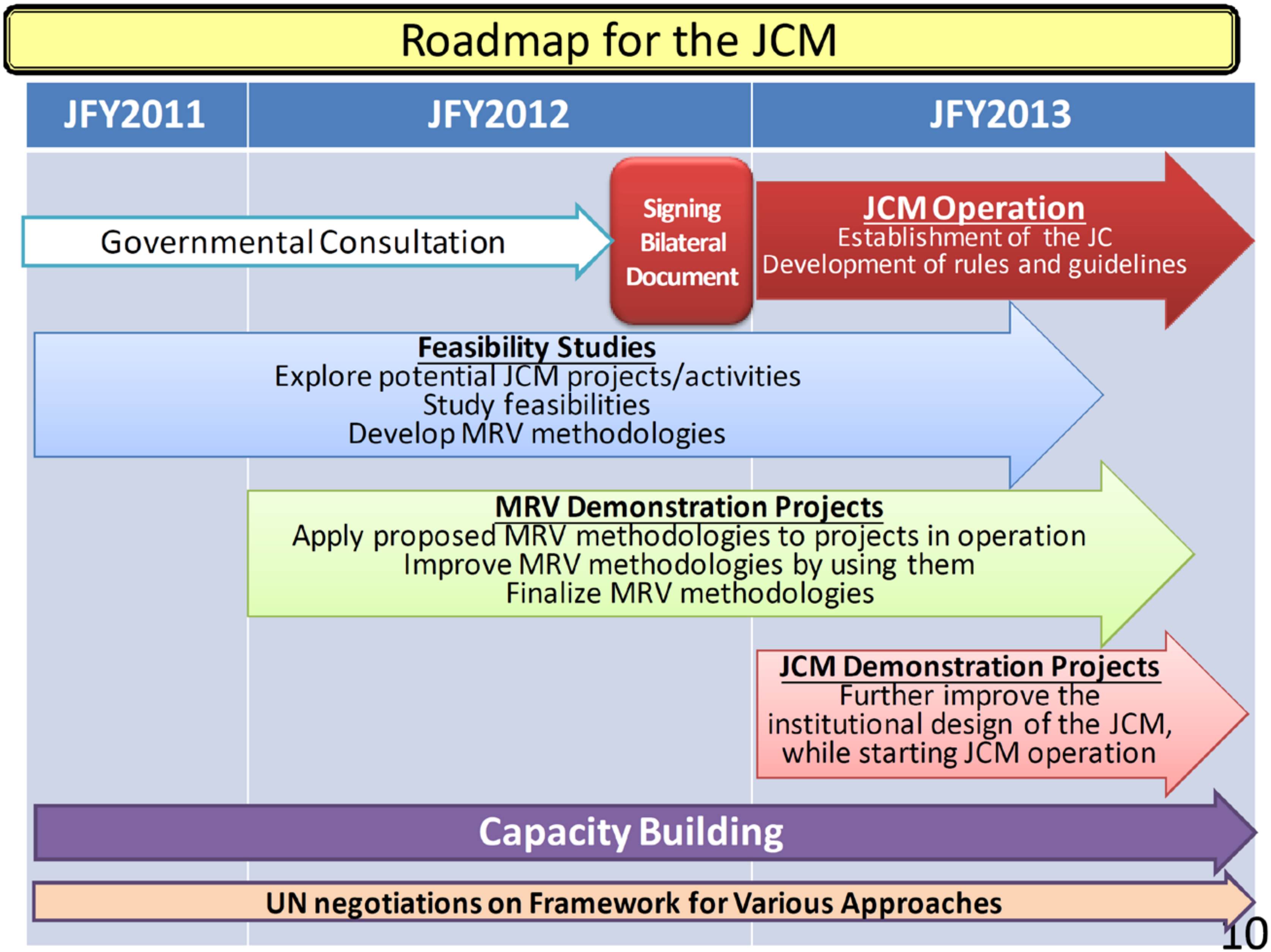
- *Validate proposed projects and their eligibility;*
- *Validate monitoring plans; and*
- Monitor based on the monitoring plans and write monitoring reports
- Verify the results

JCM Methodology

- **Key Features of the JCM methodology**
  - The methodologies are designed, in such a way that project participants can use them easily and verifiers can verify the data easily.
  - In order to reduce monitoring burden, default values are widely used in a conservative manner
  - Eligibility criteria clearly defined in the methodology can reduce the risks of rejection of the projects proposed by project participants.

Eligibility criteria	A "check list' will allow easy determination of eligibility of a proposed project under the JCM and applicability of JCM methodologies to the project.
Data (parameter)	• List of parameters will inform project participants of what data is necessary to calculate GHG emission reductions/removals with JCM methodologies. • Default values for specific country and sector are provided beforehand.
Calculation	Premade spreadsheets will help calculate GHG emission reductions/removals automatically by inputting relevant values for parameters, in accordance with methodologies.

Slide 21 of "Recent Development of The Joint Crediting Mechanism (JCM) /Bilateral Offset Credit Mechanism (BOCM) (May 2013)



Slide 10 of “Recent Development of The Joint Crediting Mechanism (JCM) /Bilateral Offset Credit Mechanism (BOCM) by Gov.J (May 2013)

→ GEC has been the secretariat of MOEJ’s JCM Feasibility Study Programme.

2. MOEJ's JCM FS Programme 2012

MRV Demonstration Projects (MRV DS)

- The MRV DS were conducted for ongoing projects. The studies were to develop draft MRV methodologies, which would be applied to the respective projects/activities in order to measure, report and verify the amount of GHG emission reductions in cooperation with local counterparts in host countries.

JCM Feasibility Studies (JCM FS)

- The targets of the JCM FS are potential projects that can be part of the JCM. The purposes of these FSs are the following:

  To develop draft MRV methodologies applicable to the respective projects;

  To assess the possibility of each project/activity to be implemented under the JCM;

  To accumulate knowledge and experience acquired through the above-mentioned processes.

MOEJ's MRV Demonstration Projects & JCM/BOCM Feasibility Studies in FY2012

◆-- **MRV Demonstration Study (DS)**
◇-- **BOCM Feasibility Study (FS)**

EE= Energy Efficiency
MRT= Mass Rapid Transit

Mongolia:
- ◆ Geo-Thermal Heat Pump for Heating
- ◆ High-Efficient Heat Only Boilers (HOBs)

India:
- ◆ Bagasse-based Power Generation w/ Waste Heat Utilization

Moldova:
- ◆ Biomass Boiler Heating using Agricultural Waste as Fuel

Sri Lanka:
- ◆ Biomass-based Thermal Energy Generation

Lao PDR:
- ◆ Efficient Buses and Provision of Good Services
- ◇ Mechanical Biological Treatment (MBT) of MSW,/Landfill Gas (LFG) Capture, Flaring and Utilization

Indonesia:
- ◇ Solar-Diesel Hybrid Power Generation to Stabilize PV Power Generation
- ◇ Prevention of Peat Degradation through Groundwater Management and Rice Husk-based Power Generation
- ◇ REDD+ for Conservation of Peat Swamp Forest, and Biomass-based Power Generation using Timber Mill Waste to Process Indigenous Trees derived from Conserved Forest

Thailand:
- ◆ Bagasse-based Cogen. at Sugar Mill
- ◆ Construction of MRT System
- ◆ Energy Savings through BEMS
- ◆ Waste Heat Recovery System w/ Cogen.
- ◇ Electronic Gate to Int.Trade Port to Improve Port-related Traffic Jam

Viet Nam
- ◆ Integrated EE Project at Beer Factory
- ◇ Biogas-based Cogen. w/ Digestion of Methane from Food/Beverage Factory Wastewater
- ◇ Improvement of Vehicle Fuel Efficiency through Introduction of Eco-Drive Management System
- ◇ REDD+ through Forest Mgmt and Biomass-based Power Gen. using Timber Industry Waste

Viet Nam, and Indonesia
- ◇ MRT System

Cambodia:
- ◆ Methane Recovery and Utilization from Livestock Manure using Bio-digesters
- ◇ Small-scale Biomass Power Generation w/ Stirling Engine
- ◇ REDD+ in Tropical Lowland Forest

Mexico:
- ◆ Small-scale Wind Power Generation with Remote Monitoring System

Colombia:
- ◇ Geothermal Power Generation under Suppressed Demand

3. Examples of draft MRV methodologies

1. Small-scale Biomass Power Generation with Stirling Engine in Cambodia
2. Solar-Diesel Hybrid Power Generation to Stabilize Photovoltaic Power Generation in Indonesia
3. Upgrading and Installation of High-Efficiency Heat Only Boilers (HOBs) in Mongolia

Case 1: Small-scale Biomass Power Generation with Stirling Engine in Cambodia

■ Reduction of GHG by replacing diesel-fired power generation at small rice mills with low cost and easy-to-operate Stirling engines using rice husk as fuel.

■ Stirling engine with simple structure and external combustion mechanism has the following advantages.

- ✓ Easy installation
- ✓ Low maintenance
- ✓ Low level of NOx, SOx and noise
- ✓ Customized generation output

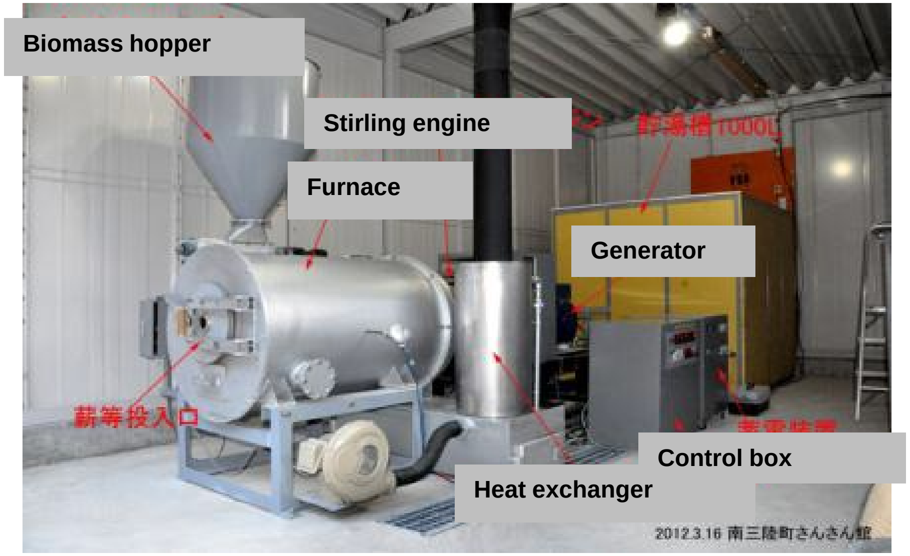


Photo provided by Pro-Material Co., Ltd.

Case 1: Small-scale Biomass Power Generation with Stirling Engine in Cambodia

Reference Emissions (RE) = Generated electricity × CO_2 EF of diesel

Project Emissions (PE) = 0

→ 'Generated electricity' from the entire system should be measured continuously using a metering device. Data may be compiled remotely.

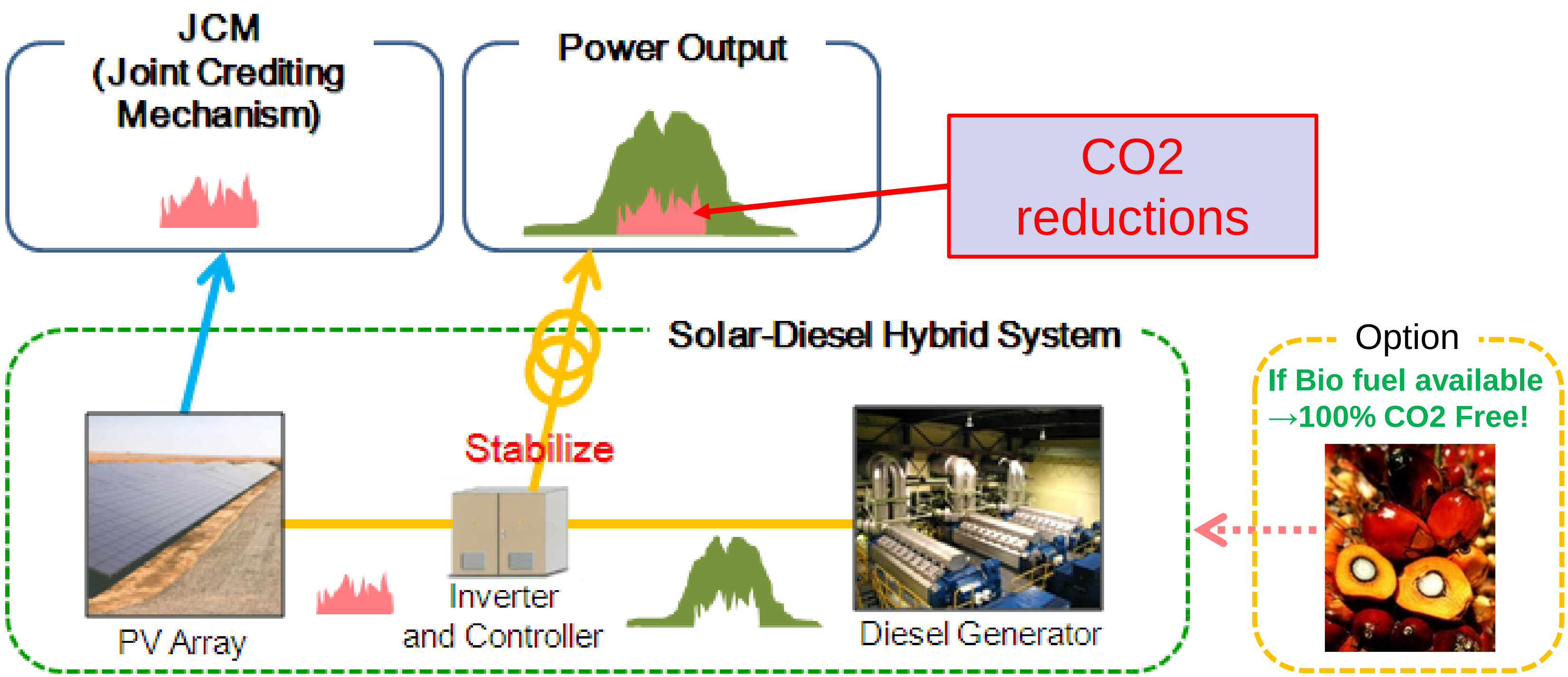
***CO2 EF of diesel*: 0.8kgCO2/kWh**

The default EF of diesel is decided based on:

Reference	Default CO2 EF for diesel power generation	Note
CDM meth AMS-I.A	0.8kgCO2/kWh	Captive power generation using diesel
CDM meth AMS-I.F	0.4kgCO2/kWh	If electricity consumption in baseline is greater than that of project scenario
	1.3kgCO2/kWh	If electricity consumption in baseline is less than that of project scenario
Past study for CDM standardized baseline	0.81kgCO2/kWh	For off-gird projects
Survey conducted in this JCM FS	1.1kgCO2/kWh	Based on data from 34 rice mills in 3 provinces (the lower end of the 95% confidence level)

Case 2: Solar-Diesel Hybrid Power Generation to Stabilize PV Power Generation

- **Solar power systems** can reduce CO_2 emissions, but their power fluctuates in proportion to solar irradiation.
- **Diesel engines** have the advantage of continuous power output.
- By combining a diesel engine with solar power, utilizing an inverter and a hybrid system controller, the total power output can be stabilized.



Case 2: Solar-Diesel Hybrid Power Generation to Stabilize PV Power Generation

Reference Emissions (RE)

= Generated electricity (as the entire system) × CO_2 EF

➔ 'Generated electricity' from the entire system and the diesel engine should be monitored, through the electricity meters.

CO2 EF for the calculation of RE:

Large-scale grid: Grid EF published by the Indonesian Government (default value)

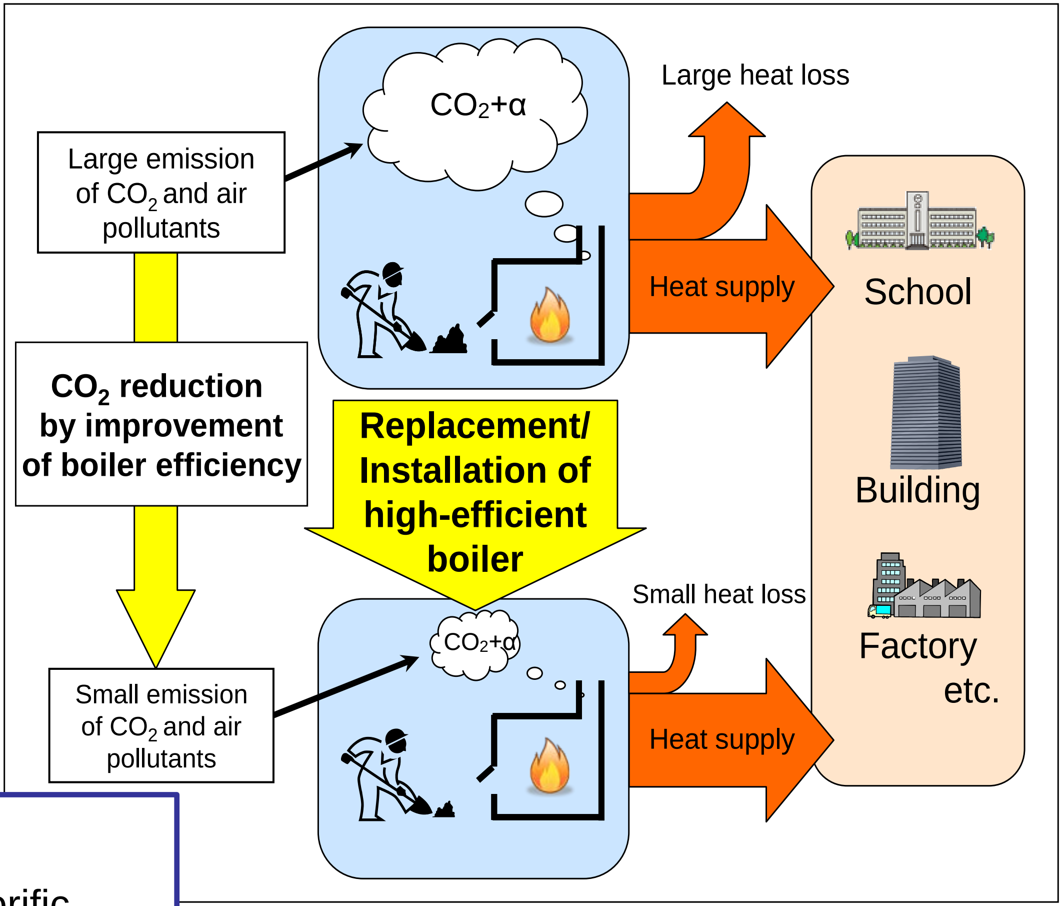
Small-scale grid / off-grid:

- In the case all power plants are using liquid fuels (= diesel), default values decided for a modern diesel-based generator of the relevant capacity operating at optimal load
  ➔ FS indicates the applicable EF is 0.7tCO2/MWh.
- In the case not all power plants are using liquid fuels, weighted average EF of the current generation mix

Easy and conservative calculation, compared to the calculation of CM (combined margin) under CDM

Case 3: Upgrading and Installation of High-Efficiency Heat Only Boilers (HOBs) in Mongolia

- This project/activity refers to the activity to replace low-efficient old type HOBs with higher efficient boilers.
- The improvement of boiler efficiency lead to emission reductions of GHG and other air pollutants.



AM0044 (CDM Methodology Booklet)
Monitored

- Amount of fossil fuel consumed, net calorific value of fossil fuel, emission factor of fossil fuel, oxidation factor of fossil fuel in each boiler in the project;
- Total thermal output of each boiler in the project.

Case 3: Upgrading and Installation of High-Efficiency Heat Only Boilers (HOBs) in Mongolia

CO2 emission factor

	Total Moisture	Gross Calorific Value	Net Calorific Value	Air-Dried Basis Carbon Analysis	CO_2 EF
Unit	(%)	(cal/g)	(cal/g)	(%)	(tCO_2/GJ)
1	23.47	4142	3844	54.57	0.0951
2	22.84	4104	3811	52.72	0.0935
3	27.49	3964	3653	55.35	0.0962
4	26.52	3935	3631	54.48	0.0966
5	10.99	4,469	4,241	51.32	0.0943
6	9.23	4,566	4,354	50.54	0.0923
7	23.37	4,231	3,927	54.78	0.0936
8	36.48	3,657	3,308	58.31	0.0981
9	29.00	3,899	3,585	55.18	0.0957
10	25.52	4,101	3,796	55.51	0.0954

Case 3: Upgrading and Installation of High-Efficiency Heat Only Boilers (HOBs) in Mongolia

CO2 emission factor

	Total Moisture	Gross Calorific Value	Net Calorific Value	Air-Dried Basis Carbon Analysis	CO2 EF
Unit	(%)	(cal/g)	(cal/g)	(%)	(tCO_2/GJ)
11	24.44	3,293	3,019	45.04	0.0987
12	25.47	4,415	4,101	59.21	0.0942
13	23.41	3,256	2,986	42.98	0.0965
14	38.46	3,473	3,124	56.57	0.0976
15	43.61	2,924	2,565	51.30	0.0988
16	26.30	3,932	3,626	53.02	0.0944
17	29.55	3,634	3,322	51.28	0.0952
				Average	**0.096**

CO_2 Emission Factor “Other Bituminous Coal”= **0.0946** (tCO2/TJ)

CO_2 Emission Factor “Sub-Bituminous”= **0.0961** (tCO2/TJ)

CO_2 Emission Factor “Lignite”= **0.1010** (tCO_2/TJ)

Source: ”2006 IPCC Guidelines for National Greenhouse Gas Inventories”

Case 3: Upgrading and Installation of High-Efficiency Heat Only Boilers (HOBs) in Mongolia

$$ER_y = PH_y \times (1/\eta_{RE\ HOB} - 1/\eta_{PJ\ HOB}) \times EF_{CO2,f}$$

ER_y Emission reduction by the project activity (tCO_2/y)

PH_y **Net heat quantity supplied by the Project HOB (GJ/y)**

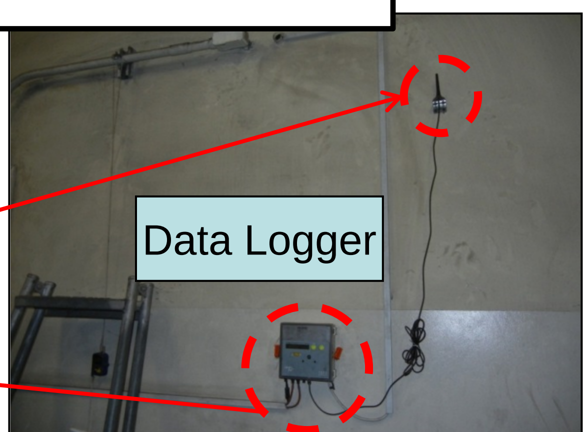
$\eta_{RE\ HOB}$ Boiler efficiency of the reference HOB (–)

$\eta_{PJ\ HOB}$ Boiler efficiency of the project HOB (–)

$EF_{CO2,f}$ CO_2 emission factor of the coal (tCO_2/GJ)

PHy is measured actually by heat meter in accordance with MNS(Mongolia National Standard) for the purpose of securing accurate measurement

The First Construction of the data collection system of the heat meter using the mobile telephone system in Mongolia



Verification of GHG emission reductions using a Model Project.

Lessons learned from JCM DS/FS in 2012

- Simple and practical draft MRV methodologies* have been developed, which includes:
  - ➔default values (ex. EF(diesel), EF(coal) and boiler efficiency) by measuring model projects
  - ➔streamlined monitoring items for reducing monitoring burden (ex. Remote monitoring of generated electricity and heat quantity supplied by the HOB)
- Emission reductions were measured and reported by local project participants and verified by local verifiers.
  - ➔Necessary of capacity building for local verifier

** MRV methodologies are drafted as the result of the GEC's JCM Demonstration Study and Feasibility Study in JFY2012. Therefore, MRV draft methodologies including default values are not officially approved by any governments involved in JCM, and are subject to change in the future.*

Thank you very much for your attention!

Osamu Bannai
Programme Officer, Carbon Management Dept.
Global Environment Centre Foundation (GEC)
bannai@gec.jp

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