Bilateral Offset Credit Mechanism Proposed Methodology Form

Note: This methodology is drafted as the result of the GEC's JCM Feasibility Study Programme in JFY2013. Therefore, this draft methodology is not officially approved by any governments involved in JCM, and is subject to change in the future.

Cover sheet of the Proposed Methodology Form

Form for submitting the proposed methodology

Host Country	The People's Republic of Bangladesh
Name of the methodology proponents submitting this form	Sony Energy Device Corporation
Sectoral scope(s) to which the Proposed Methodology applies	1.Energy industries (renewable - / non-renewable sources)
Title of the proposed methodology, and version number	Methodology for renewable energy generation using photovoltaic generation and long-life battery system
List of documents to be attached to this form (please check):	☐The attached draft BOCM-PDD: ☒Additional information Bilateral Offset Credit Mechanism Proposed Methodology Spreadsheet Form (input sheet) [Attachment to Proposed Methodology Form]
Date of completion	21/02/2014

History of the proposed methodology

Version	Date	Contents revised
1.0	10/10/2013	1st. edition
2.0	08/01/2014	2nd.edition
3.0	21/02/2014	3rd.edition

A. Title of the methodology

Methodology for renewable energy generation using photovoltaic and long-life battery system in No-Electrification area.

B. Terms and definitions

Terms	Definitions
Photovoltaic (PV) generation	Power generation system that transforms sunlight into electricity.
Long-life battery	The battery can keep more than 80% recovery capacity after 6,000 cycles by DOD (Depth of Discharge) 100% of full cycle and 1ItA charge and discharge under the specific temperature environment.
Grid	Electricity transmission and distribution system from power plant to transformer station and from transformer station to consumer.
No-Electrification area	The area that people cannot use electricity in effect. The area includes off-grid area and people cannot access the grid because of low income.

C. Summary of the methodology

Items	Summary
GHG emission reduction measures	Electricity from long-life battery system which is generated by the photovoltaic power generator replaces electricity from power generators using fossil fuels and electricity from grid.
Calculation of reference emissions	Reference emissions are calculated on the basis of electricity output from long-term battery system. Long-life battery system is charged by PV and electricity is used only from the long-life battery system.
Calculation of project emissions	None
Monitoring parameters	Electricity consumption from long-life battery system

D. Eligibility criteria

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

Criterion 1	Renewable energy generation means photovoltaic generation.
Criterion 2	Long-life battery system is charged by PV only.
Criterion 3	Using Long-life battery that can keep more than 80% recovery capacity after 6,000 cycles by DOD (Depth of Discharge) 100% of full cycle and 1ItA charge and discharge under the specific temperature environment. Long-life battery needs to acquire certifications for product safety standard set by the organization in Japan, United States and EU below. ● JISC (Japanese Industrial Standards Committee) ● UL (Underwriters Laboratories Inc.) ● IEC (International Electrotechnical Commission)
Criterion 4	Long-life battery distributes electricity to the neighborhood residents, organizations, and companies.
Criterion 5	The project must be conducted in No- Electrification area.

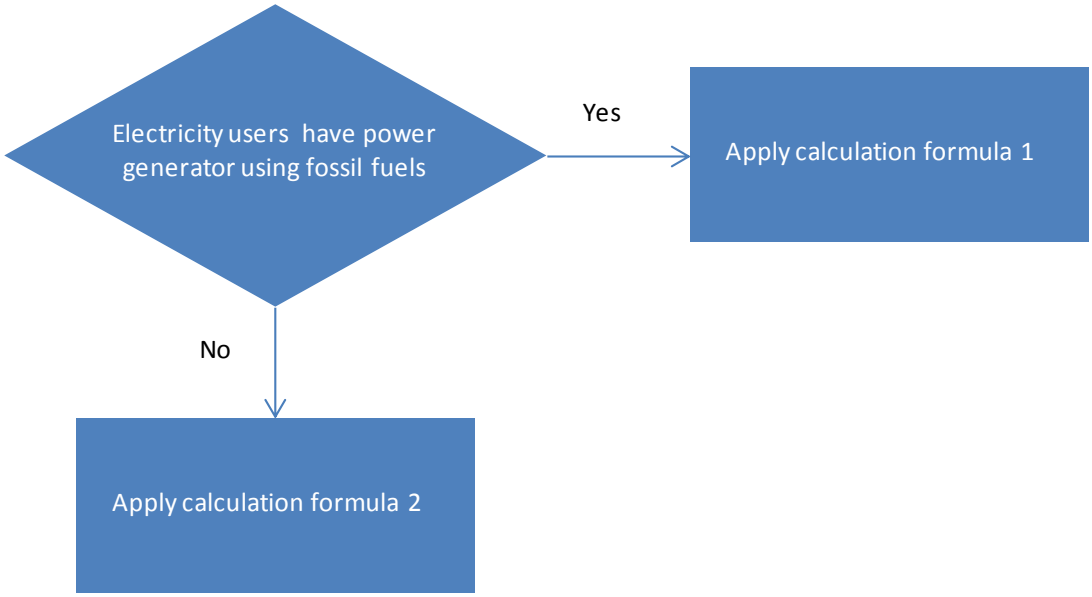
E. Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Fossil fuel consumption by power generators	CO_2
Fossil fuel consumption by power plants	CO_2
N/A	N/A
N/A	N/A
N/A	N/A
Project emissions	
Emission sources	GHG types
N/A	N/A
N/A	N/A
N/A	N/A
N/A	N/A
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 electricity output from long-term battery system. Long-life battery system is charged by PV and electricity is used only from the long-life battery system. The reference scenario is that electricity from power generators using fossil fuels or electricity from the grid would be used if the PV and long-life battery system were not installed. Therefore, the reference emissions are derived from fossil fuels used by power generators or fossil fuels used by power plant which generate electricity to the grid. Decide reference emission calculation formula using flow chart below;



Energy conversion efficiency (%) of power generators using fossil fuels are needed to estimate former reference emissions, but it is very hard to specify the actual or default efficiency in The People's Republic of Bangladesh. Because of that, the efficiency of power generators which are prevailing in Japan can be used as substitute value. Usually, the efficiency in Japan is one of the highest in the world so the calculation result of the reference emissions can be conservative. This methodology defines it as reference emissions since it is lower than the emissions which are calculated using the actual or default efficiency in The People's Republic of Bangladesh.

CO2 emission coefficient for the grid electricity of Bangladesh is needed to estimate latter reference emission. The coefficient is derived from the statistic data made by authorities in Bangladesh*[1].

Since people in No-Electrification area in Bangladesh usually use kerosene lamp, the project using this methodology replaces this lamp with lights using electricity so reference emission

can be CO2 emissions derived from kerosene. However this methodology uses CO2 emission coefficient for the grid electricity of Bangladesh to calculate the latter reference emissions because;

- Many people in Non-Electrification area already have mobile phones. They are charging mobile phones at stores in the electric area by paying cash or at houses of their relatives and/or friends in the electric area. It is natural that these people will use electricity by the project using this methodology for lights and charging mobile phones. In this case, it is very difficult to know how much power is used for lamp and how much for charging mobile phones.
- It is clear by feasibility study to create this methodology that CO2 emissions derived from electricity usage per unit of time for lights are smaller than CO2 emissions derived from kerosene lamp per unit of time. Hence using CO2 emission coefficient for the grid electricity of Bangladesh to calculate the latter reference emissions is conservative.

*[1]: Government of the People's Republic of Bangladesh, Department of Environment, Reference No. DOE / International Convention/ 2012/21/07, 2013, "Subject: Grid Emission Factor (GEF) of Bangladesh"

F.2. Calculation of reference emissions

1. Calculation formula 1

Energy conversion efficiency (%) is needed to estimate reference emissions. Actual value or default value of the power generator's specification can be used for this efficient. When specifying the actual or default efficiency in The People's Republic of Bangladesh, the efficiency of power generator which prevails in Japan can be used as substitute value. This efficiency may come from the specification of the power generator that has highest market share in Japan, but it is needed to set the generation capacity (KVA) of the power generator based on the small survey to identify the prevailing power generator and its generation capacity (KVA) in the project area.

Usually, the efficiency in Japan is one of the highest one in the world. Because of that, the calculation result of the emissions using this efficiency can be conservative. This methodology defines the emissions as reference emissions. The calculation formula is;

$$RE_y = E_{PJ,y} \times \frac{1}{\alpha} \times CEF_{CO2,f,i,y}$$

RE_y: Reference CO_2 emissions during the period of year y [tCO_2]

$E_{PJ,y}$: Project electricity consumption from long-life battery system during the period of year y [kWh]

α: Energy conversion efficiency of the power generators using fossil fuels (kWh/GJ)

$CEF_{CO2,f,i,y}$: CO_2 emission factor of fossil fuel i (such as diesel oil, gasoline, and so on) in year y [tCO_2/GJ]

Note: Usually, α is needed to calculate using fossil fuel net heating value. Such value in the IPCC Guidelines[*2] can be used.

*[2]: Intergovernmental Panel on Climate Change, 2006, "2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy"

2. Calculation formula 2

Reference emissions are calculated by electricity output from long-term battery system and CO2 emission coefficient for the grid electricity of Bangladesh derived from the statistic data made by authorities in Bangladesh*[3]. The calculation formula is;

$$RE_y = E_{PJ,y} \times CEF_{CO2,e,y}$$

RE_y: Reference CO_2 emissions during the period of year y [tCO_2]

$E_{PJ,y}$: Project electricity consumption from long-life battery system during the period of

year *y* [kWh]

$CEF_{CO2,e,y}$: CO2 emission coefficient for the grid electricity of Bangladesh during the period of year *y* [$kgCO_2/kWh$]

*[3]: Government of the People's Republic of Bangladesh, Department of Environment, Reference No. DOE / International Convention/ 2012/21/07, 2013, "Subject: Grid Emission Factor (GEF) of Bangladesh"

G. Calculation of project emissions

N/A (The project using this methodology has no project emissions.)

H. Calculation of emissions reductions

$$ER_y = RE_y - PE_y$$

ER_y: GHG emission reductions in year *y* [tCO_{2e}/y]

RE_y: Reference emissions in year *y* [tCO_{2e}/y]

PE_y: Project emission in year *y* [tCO_{2e}/y]

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
$CEF_{CO2,f,i,y}$	CO_2 emission factor of fossil fuel *i* (such as diesel oil, gasoline, and so on) in year *y* [tCO_2/GJ]	Intergovernmental Panel on Climate Change, 2006, "2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy
$CEF_{CO2,e,y}$	CO2 emission coefficient for the grid electricity of Bangladesh during the period of year *y* [$kgCO_2/kWh$]	● Government of the People's Republic of Bangladesh, Department of Environment, Reference No. DOE / International Convention/ 2012/21/07, 2013, "Subject: Grid Emission Factor (GEF) of Bangladesh"