Joint Crediting Mechanism Approved Methodology KH_AM002

"Installation of Solar PV System"

A. Title of the methodology

Installation of Solar PV System, Ver 01.0

B. Terms and definitions

Terms	Definitions
Solar photovoltaic (PV) system	An electricity generation system which converts sunlight into electricity by the use of photovoltaic (PV) modules. The system also includes ancillary equipment such as inverters required to change the electrical current from direct current (DC) to alternating current (AC).

C. Summary of the methodology

Items	Summary
GHG emission reduction measures	Displacement of grid electricity and/or captive electricity using diesel fuel as power source by installation and operation of the solar PV system(s).
Calculation of reference emissions	Reference emissions are calculated on the basis of the AC output of the solar PV system(s) multiplied by either; 1) the conservative emission factor of National Grid electricity or 2) the conservative emission factor of diesel power generator in off-gird area.
Calculation of project emissions	Project emissions are the emissions from the solar PV system(s), which are assumed to be zero.
Monitoring parameters	The quantity of the electricity generated by the project solar PV system(s) and category of the day *d.*

D. Eligibility criteria

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

Criterion 1	The project installs solar PV system(s).
Criterion 2	The PV modules have obtained a certification of design qualifications (IEC 61215, IEC 61646 or IEC 62108) and safety qualification (IEC 61730-1 and IEC 61730-2).
Criterion 3	The equipment to monitor output power of the solar PV system(s) and irradiance is installed at the project site.

E. Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Consumption of grid electricity and/or captive electricity	CO_2
Project emissions	
Emission sources	GHG types
Generation of electricity from solar PV system(s)	N/A

F. Establishment and calculation of reference emissions

F.1. Establishment of reference emissions

Considering that the flowing electricity of Cambodian grids is consisted of electricity generated by coal-fired power plant, oil power plant, hydropower plant, biomass power plant and imported electricity, the conservative operating margin is applied to reflect an electricity mix in National Grid of Cambodia in order to secure net emission reduction. Due to the limited data for heat efficiency of each power plant, the emission factor for each electricity source is set to 0.750 tCO_2/MWh for the coal-fired power plants and 0.533 tCO_2/MWh for the oil-fired power plants which is calculated by applying the default heat efficiency of 49%, an efficiency level which is above the value of the world's leading diesel power generator. Since those emission factors have not been achieved in Cambodia, they lead to net emission reductions. For the emission factor of import electricity, the hydropower plants and the biomass power plants, 0 tCO_2/MWh is applied. As a result, in case the PV system in a proposed project activity is connected to the national grid, the emission factor is calculated to be 0.353 tCO_2/MWh. In case the PV system in a proposed project activity is connected to an internal grid which is not connected to the national grid, the emission factor is set to 0.533 tCO_2/MWh.

F.2. Calculation of reference emissions

For calculation of reference emissions, either Case1 or Case 2 is selected.

Case1: If the project PV system supplies electricity to a national grid or the annual business days of the facilities to which the project PV system supplies electricity are 365 days or 366 days, the following formula is applied.

$$RE_p = \sum_i \left(EG_{i,p} \times EF_{RE,i}\right)$$

RE_p : Reference emissions during the period *p* [tCO_2/p]

$EG_{i,p}$: The quantity of the electricity generated by the project solar PV system *i* during the period *p* [MWh/p]

$EF_{RE,i}$: The reference CO_2 emission factor for the project solar PV system *i* [tCO_2/MWh]

Case2: If the project PV system does not supply electricity to a national grid and the annual business days of the facilities to which the project PV system supplies electricity are less than 365 days, the following formula is applied.

$$RE_p = \sum_i \sum_d (EG_{i,d} \times \varphi_d \times EF_{RE,i})$$

RE_p : Reference emissions during the period *p* [tCO_2/p]

$EG_{i,d}$: The quantity of the electricity generated by the project solar PV system *i* on monitoring date *d* during the period *p* [MWh/p]

φ_d : Category of the day *d*. [1 for business days, 0 for holidays]

$EF_{RE,i}$: The reference CO_2 emission factor for the project solar PV system *i* [tCO_2/MWh]

G. Calculation of project emissions

$PE_p = 0$

PE_p : Project emissions during the period *p* [tCO_2/p]

H. Calculation of emissions reductions

$ER_p = RE_p - PE_p$
$= RE_p$

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*

The source of each data and parameter fixed *ex ante* is listed as below.

Parameter	Description of data	Source
$EF_{RE,i}$	The reference CO_2 emission factor for the project solar PV system *i*. The value for $EF_{RE,i}$ is selected from the emission factor based on the national grid ($EF_{RE,i,grid}$) or based on captive diesel power generator ($EF_{RE,i,cap}$) in the following manners: In case the PV system in a proposed project activity is connected to the national grid, $EF_{RE,i,grid}$, 0.353 tCO_2/MWh is applied. In case the PV system in a proposed project activity is connected to an internal grid which is not connected to the national grid, $EF_{RE,i,cap}$, 0.533 tCO_2/MWh is applied.	Additional information The default value should be revised if necessary from survey result which is conducted by JC.

History of the document

Version	Date	Contents revised

01.0	4 February 2017	Electronic decision by the Joint Committee Initial approval.