Joint Crediting Mechanism Approved Methodology CL_AM001

"Installation of Solar PV System"

A. Title of the methodology

Installation of Solar PV System, Version 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 fossil 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) conservative emission factor of the grid, or 2) conservative emission factor of the captive diesel power generator.
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)

D. Eligibility criteria

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

Criterion 1	The project newly installs solar PV system(s).
Criterion 2	The PV modules are certified for design qualifications (IEC 61215,IEC 61646 or IEC 62108) and safety qualification (IEC 61730-1 and IEC 61730-2).
Criterion 3	The equipment used for monitoring 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 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

The default emission factor is set in a conservative manner for the Chilean regional grids: the Central Interconnected System (SIC), the Northern Interconnected System (SING), the Aysén system, and the Magallanes system.

The emission factor is calculated based on the conservative operating margin that reflects on the latest electricity mix including low cost/must run resources for each regional grid in Chile during 2014-2016 and refers to the conservative emission factor of each fossil fuel power plant in order to secure net emission reductions. The conservative emission factor of each plant is calculated to be 0.826 tCO_2/MWh for coal-fired power plant and 0.364 tCO_2/MWh for gas-fired power plant based on the survey on heat efficiency of power plant in Chile. The emission factor for diesel power plant is calculated to be 0.533 tCO_2/MWh based on a default heat efficiency of 49%, an efficiency level which is above the value of the world's leading diesel power generators.

In case the PV system(s) in a proposed project activity is directly connected or connected via an internal grid, not connecting to a captive power generator, to a regional grid (PV Case 1), the

value of operating margin including LCMR resources, using the best heat efficiency among currently operational plants in Chile in calculating emission factors of fossil fuel power plants, are applied. The emission factors to be applied in this case are shown as "PV Case 1" in section I of this methodology.

In the case the PV system(s) in a proposed project activity is connected to an internal grid connecting to both a regional grid and a captive power generator (PV Case 2), the lower value between emission factors shown as "PV Case 1" in section I of this methodology and the conservative emission factor of diesel-fired power plant of 0.533 tCO_2/MWh is applied. The emission factors to be applied in this case are shown as "PV Case 2" in section I of this methodology.

In the case that the PV system(s) in a proposed project activity is only connected to an internal grid connecting to a captive power generator (PV Case 3), the emission factor of a diesel generator calculated by applying the heat efficiency of 49%, an efficiency level which is above the value of the world's leading diesel generator, which is set to 0.533 tCO_2/MWh, is applied.

The emission factors to be applied in each case are shown in Section I. Data and parameters fixed ex ante of this methodology.

F.2. Calculation of reference emissions

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

RE_p : Reference emissions during the period p [tCO_2/p]
$EG_{i,p}$: Quantity of the electricity generated by the project solar PV system i during the period p [MWh/p]
$EF_{RE,i}$: Reference emission factor of 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
$EF_{RE,i}$	Reference emission factor of the project solar PV system *i*. The value for $EF_{RE,i}$ is selected from the list of emission factors in the following manner: <u>PV Case 1:</u> In case the PV system(s) in a proposed project activity is connected to a regional grid including through internal grid which is not connected to a captive power generator, $EF_{RE,i}$ is set as follows per the connected regional grid: Regional grid name: — Emission factor for PV Case 1: SIC (Central System) — 0.314 tCO_2/MWh SING (Northern System) — 0.718 tCO_2/MWh Aysén System — 0.200 tCO_2/MWh Magallanes System — 0.361 tCO_2/MWh <u>PV Case 2:</u> In case the PV system(s) in a proposed project activity is connected to an internal grid connected to both a regional grid and a captive power generator, $EF_{RE,i}$ is set as follows per the connected regional grid:	<u>Additional information</u> The default emission factor is obtained from a study of electricity systems in Chile and the most efficient diesel power generator (49% heat efficiency). The default value is revised if deemed necessary by the JC.

	Regional grid name: Emission factor for PV Case 2: SIC (Central System) 0.314 tCO_2/MWh SING (Northern System) 0.533 tCO_2/MWh Aysén System 0.200 tCO_2/MWh Magallanes System 0.361 tCO_2/MWh <u>PV Case 3:</u> In case the PV system(s) in a proposed project activity is connected to an internal grid which is not connected to the regional grid, $EF_{RE,i}$ is set at 0.533 tCO_2/MWh.	

History of the document

Version	Date	Contents revised
01.0	19 December 2017	JC2, Annex 5 Initial approval.