Programme of activities design document form
(Version 09.0)

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION	
Title of the PoA	The Solar United Network South East Asia Pacific (SUNSEAP) Program
Version number of the PoA-DD	04
Completion date of the PoA-DD	07/12/2020
Coordinating/managing entity	Climate Resources Exchange International Pte Ltd
Host Parties	Vietnam
Applied methodologies and standardized baselines	**AMS-I.D.:** Grid connected renewable electricity generation, Version 18.0 **AMS-I.F.:** Renewable electricity generation for captive use and mini-grid, Version 3.0 **ACM0002:** Grid-connected electricity generation from renewable sources, Version 20.0 *Standardized baseline is not applicable for PoA*
Sectoral scopes	1 : Energy industries (renewable - / non-renewable sources)

PART I. Programme of activities (PoA)

SECTION A. Description of PoA

A.1. Purpose and general description of PoA

>>

Policy/measure or stated goal that the PoA seeks to promote

The program will be designed to implement as many Solar PV projects in the region to ensure that Renewable Energy is delivered to the grid for the sustainable consumption of the public and/or by private entities. In addition, the project will improve the socio-economic progress of the nation by generating employment opportunities as well as achieving several of the UN's Sustainable Development Goals of 2015.

The Sunseap Group has also partnered with the Climate Resources Exchange Group (CRX) – Singapore's oldest and most experienced carbon asset advisory group to be the Coordinating/Managing Entity to design and implement the Program within the boundaries of the UNFCCC rules on developing CDM projects and programs.

Confirmation that the PoA is a voluntary action by the CME

The main goal of the PoA is to implement renewable energy projects within the boundaries of the listed countries within boundary. This is alongside the significant importance of revenue from the sale of Certified Emission Reductions (CERs). Achieving this goal forms the basis of the implementation of this PoA. The PoA is a voluntary action and Climate Resources Exchange International Pte Ltd (hereafter referred as CRX) will be the Coordinating / Managing Entity (CME) for all the component project activities (CPAs).

There are no mandatory laws or regulations existing in host country requiring CRX or any other party to develop a programme for renewable generation plants.

Framework for the implementation of the proposed PoA

The PoA will support the development of new grid-connected renewable energy power plants within Vietnam and will cover the solar photovoltaics energy technologies. It seeks to enable investment in large and small grid connected plants that export their generated output to the regional / national electricity grid of Vietnam. Or PoA includes renewable energy generation technologies (solar) that supply electricity to users where in baseline, the users would have been supplied electricity from a national or a regional grid or Fossil fuel fired captive power plant or a carbon intensive mini-grid.

All CPAs within this PoA will consist of a single renewable technology (solar energy technologies but not cover the combination of two or more energy technologies), and also use any one methodology. Also an individual CPA will either be small-scale and micro-scale CPA (having methodology AMS I.D version 18 or AMS I.F version 03) or large-scale CPA (having methodology ACM0002 version 20) and not a combination of any two methodologies.

Separate generic CPA is prepared for each methodology for solar PV technology in line with para 78 of Project Standard for PoA version 02.0.

Thus, the following cases are represented in the generic CPA-DD.

Table 1: Possible Scenarios for this PoA with respect to CDM Framework

Scale of CPA	Configuration	Applicable CDM Methodology
Case 1: Large scale	Grid Connected (LGC)	ACM0002 (version 20.0)
Case 2: Small scale	Grid Connected (SGC)	AMS I.D (version 18.0)
Case 3: Small scale	Captive Consumption (SCC)	AMS I.F (version 3.0)

Case 4: Micro scale	Grid Connected (MGC)	AMS I.D (version 18.0)
Case 5: Micro scale	Captive Consumption (MCC)	AMS I.F (version 3.0)

The generic CPAs for above five possible scenarios are included in Parts II in this PoA-DD.

How the proposed PoA contributes to sustainable development?
Apart from generation of renewable energy-based electricity, the CPAs to be included under the PoA would contribute to the sustainable development in the Host Party - socially, environmentally, technologically and economically.

The PoA will also support Vietnam in meeting and contributing to their Intended Nationally Determined Contributions (INDCs) by reducing greenhouse gas emission to meet their respective targets, in line with their Nationally Appropriate Mitigation Actions (NAMAs).

In the case of Vietnam, this PoA will benefit the Host Party by contributing to its target of a 25% relative emission reduction compared to Business as Usual (BAU) and 30% reduction [1]in emission intensity per GDP, compared to its emissions in 2010 by 2030, through the development of renewable energy.

The specific sustainable development contributions from any CPA will be described in the corresponding CPA-DD.

A.2. Physical/geographical boundary of PoA

>>
Within the boundary Vietnam.

The physical boundary for each CPA confines to the physical boundary and geographical area of the renewable energy projects covered in the CPA. The physical boundary of each CPA will be defined in the CPA-DD.

[1] Intended Nationally Determined Contribution of Viet Nam, https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Viet%20Nam%20First/VIETNAM%27S%20INDC.pdf

A.3. Technologies/measures

>>

The proposed project activities fall under Sectoral Scope I: “Energy industries (renewable-/non-renewable sources)”.

The technology to be deployed under this PoA will be utility scale solar photovoltaic (PV) power generation with installed capacities ranging from 1 MWp and above in the host country.

Only solar photo voltaic technology projects will be part of PoA.

Solar energy collectors and converters are solar cell modules, which directly convert solar energy into direct current through the photovoltaic effect. Thanks to the inverters, the DC is converted into AC. A PV module consists of multiple solar modules connected, which can have capacity range from several dozen (W) to several tens of megawatts (MW). The inverter connected to each group will convert direct current (DC) into alternating current (AC). The post-converted power is supercharged to 110kV using transformers and exported to the Vietnamese national grid via load lines and electricity metering systems.
For PV modules manufactured for commercial purposes, the photovoltaic conversion efficiency of PV modules ranges from 14% to 20%.

A PV power production unit may in general constitute the following equipment:

- Solar PV array consisting of either:
  - Monocrystalline Solar Panels (Mono-SI)
  - Polycrystalline Solar Panels (p-Si)
  - Thin-Film: Amorphous Silicon Solar Panels (A-SI)
  - Concentrated PV Cell (CVP)
- Mounting structures (potentially also including tracking system)
- Junction box, distribution boxes and DC (direct current) cabling connecting modules with inverters
- Inverters
- Production meter on AC (alternating current) inverter output side (integrated to inverter)

- Data logger and/or gateway to internet (potentially integrated to inverter)
- Transformers
- Circuit breakers
- System for control and monitoring
- Grid utility meter
- Evacuation system / grid connection system

This technology is emerging as a plausible alternative in this country due to the following key factors:

- Increasingly insufficient and inadequate electricity supply to meet demand.
- Enhanced cost competitiveness of solar PV, being brought about not just through falling costs for PV equipment, but also the availability of climate finance to reduce the cost of capital.
- Shorter relative lead times associated with delivering projects compared to other capital-intensive generation technologies, including fossil fuel-based alternatives.
- Need for diversification of energy supply options to reduce risks associated with reliance upon fossil fuel imports.

The CPAs under this PoA will be either grid connected or captive/local generation and use, comprising installation of a new power plant (i.e for solar only and no combination of other renewable energy generation) at a site where no similar technology-based power plant was operating prior to the implementation of the CPA (i.e., green-field plant). The generated electricity will be supplied to grid or to a consumer facility via national/regional/captive grid through a suitable contractual arrangement.

Scenario existing prior to the implementation of CPA:

The scenario existing prior to the implementation of a CPA under this PoA that is grid connected, was electricity delivered to the grid by the CPA that would have otherwise been generated by the operation of grid connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”.

For any CPA that will generate renewable electricity for captive use or local/isolated grid, the pre-project scenario would have been equivalent electricity supplied from a local fossil fuel-based electricity generation source.

Baseline Scenario:

Basing on CDM definition, a Greenfield power plant is defined as “a new power plant that is constructed and operated at a site where no power plant was operated prior to the implementation of a CPA”.

As a CPA under this PoA falls under the definition of a Greenfield power plant, the baseline scenario as per applied methodologies (AMS I.D and ACM0002) is the following:

The baseline scenario is that the electricity delivered to the grid by the CPA would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.

As per applied methodology (AMS I.F), for CPAs which supply renewable energy-based electricity to users and baseline would be electricity supplied from national/regional grid, fossil fuel based captive power plant or carbon intensive mini grid.

Hence, pre-project scenario and baseline scenario are the same.

The PoA envisages to stimulate technology transfer of both equipment and knowledge where possible. to the Host Country, Viet Nam. Each CPA, if applicable, will mention where the technology

is coming from and how it is transferred to the Host Country. Depending on the complexity of the technology employed in the CPAs and the current knowledge and experience of the CPA Implementer, different training programmes will be implemented. In all cases, suitable training will be conducted for the CPA Implementers and their employees/technicians to make sure that the CPAs are implemented correctly and efficiently.

The lifespan solar project is 25 years. This has been confirmed by the technology provider.

A.4. Coordinating/managing entity

>>

Climate Resources Exchange International Pte Ltd (also referred to as CRX) will be the CME of the PoA and will communicate with the Executive Board. It is also the project participant of the PoA.

A.5. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Vietnam Socialist Republic of Vietnam (Host Party)	Climate Resources Exchange International Pte Ltd (Private entity)	No

A.6. Public funding of PoA

>>

The PoA will not receive any public funding from the parties listed in the Annex I. Also, the PoA will not involve diversion of the Official Development Assistance (ODA).

SECTION B. Management system

>>

As per CDM project standard for programmes of activities (Ver.2.0), para 36, The coordinating/managing entity shall establish and implement, and provide a description of, the operational and management system for the implementation of the proposed CDM PoA, including the following:

a) A clear definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies.

Climate Resources Exchange International Pte Ltd is the Coordinating / Managing Entity (CME) for the PoA and is the overall in charge for operational and management arrangements for the implementation of the PoA. It shall have the following responsibilities with respect to the implementation of the PoA:

- Creating PoA documentation (forms F-CDM-PoA-DD and F-CDM-CPA-DD)
- Check for compliance of CPAs with inclusion eligibility criteria
- Obtaining a Letter of Authorization from the host country
- Obtaining a Letter of Approval from the host country and the Annex I party involved for the CPA
- Coordinating and communicating with the validating/verifying DoE and the EB
- Conduct training and capacity building exercises for personnel of CPA implementing bodies for data monitoring, recording and reporting in accordance with CPA-DD
- Periodically collecting data on monitoring parameters from CPA implementing bodies as per the monitoring plan defined in the respective CPA-DD
- Drafting monitoring reports for all CPAs in accordance with the methodology outlined in the PoA-DD

- Requesting the UNFCCC to issue CERs into a registry account of the CER buyer(s).

Entity Involved	Role and Responsibilities	Relevant Competency
CPA Implementer	• Support each CPA to be well executed locally and be responsible for installation and maintenance • Will collect monitoring data according to monitoring plan • Will monitor activity of its staff and agents • Will provide the required documents for inclusion and verification of CPAs to the CME	• Have knowledge of technologies, monitoring requirements • Maintain close communication with CPA implementers • Good understanding of requirements for inclusion and verification of CPAs.
Analyst, CME	• Obtains the input from the CPA DD project participant • Calculates the energy savings and approves the additionality of the CPA • Trains the CPA DD Project participant representative on monitoring plan.	• Maintain close communication with the CPA implementers • Understanding of additionality criteria • Good Training Skills • Understanding of monitoring plan
Expert, CME	• Analyzes the computation sheet provided by Analyst CME for the computations of the energy savings and approves the additionality of the CPA • Forwards the CPA to Director CME for the inclusion into PoA	• Knowledge of additionality criteria and energy savings calculation • Understanding of the Monitoring Plan.
Consultant, CME	• Determines the energy savings of the CPA • Prepare CPA DD documentation and monitoring reports for emission reduction verification. • Reviews the computations of the energy savings	• Knowledge of emission reduction calculation • Knowledge of verification • Understanding of the CPA DD
Director, CME	• Reviews the additionality and eligibility criteria as determined by the analyst. • Approves the CPA DD for the inclusion and forward it to the DOE • Liaising with the DOE in relation to periodical PoA verifications and CERS issuances.	• Knowledge of additionality criteria and energy saving calculation • Understanding of the CPA DD • Maintain close communication with DOE

b) Records of arrangements for training and capacity development for personnel.

A CDM PoA team shall be constituted by the CME to check compliance of new CPAs proposed for inclusion under the PoA. All eligibility criteria for inclusion of new CPAs in the CPA as provided in Section K of this document shall be checked thoroughly against any of the suggested documentary evidence sources provided in the same section.

The team shall consist of professionals with sufficient competence to assess eligibility

c) A procedure for technical review of inclusion of CPAs:

The inclusion of CPAs will be prepared by the CME Expert, and reviewed by the CME Director.

d) A procedure to avoid double counting:

CPA owners will confirm in the Inclusion Contract that the PV plant included as or as part of a CPA is and shall not be registered under any other emission reduction scheme or programme. The CDM Director will cross-check if any PV plant is registered with CDM and other registries.

e) Records and documentation control process for each CPA under the PoA
The CME expert will keep records and documentation for each CPA. Measures for continuous improvements of the PoA management system: The CME Directors will review in annual meetings the PoA management system, and initiate improvements where necessary. The CME will be responsible for the operational and management system for the implementation of the PoA, as established in accordance with the applicable provisions in the project standard. Other

f) Any other relevant elements.

CRX, the coordinating/managing entity shall have the competencies to check the features of potential CPAs and ensure that each CPA meets all requirements and eligibility criteria for inclusion of CPAs in the proposed CDM PoA before its inclusion.

SECTION C. Demonstration of additionality of PoA

>>

Demonstration of additionality of proposed PoA:

As per Standard for “CDM project standard for programmes of activities” Version 02.0, Section 7.4, Para 38 demonstration of additionality will be applied by “establishing that in the absence of the PoA, none of the CPAs that will be implemented under the PoA would occur.”. There is no mandatory law or requirement in Viet Nam for the installation of solar PV technologies/measures. Hence this voluntary coordinated action would not be possible in the absence of the PoA, due to the cost associated with it.

For the proposed PoA, each CPA will apply any one of the methodologies out of AMS I.D (version 18) or AMS I.F (version 03) or ACM0002 (version 20). Since the location of all the CPAs are not known, the additionality will be demonstrated on a CPA level, by applying the additionality inclusion criteria defined in the PoA-DD. The additionality for each CPA will be demonstrated as per eligibility criteria, by demonstrating that the CPA would otherwise not be implemented due to the existence of relevant barrier(s). The demonstration of the existence of one or more barriers for the implementation of the CPA is included as the eligibility criteria for the inclusion of a CPA in PoA.

Reduction of anthropogenic GHG emissions by implemented CPA under PoA:

The electricity generated by any CPA included in the PoA (for AMS I.D and ACM0002 methodologies) will replace the equivalent amount of electricity generated by the operation of existing/ new grid connected power plants (mostly fossil fuel-based power plants) and by addition of new generation sources into the grid. Also, any CPA (for AMS I.F methodology) can include-renewable energy generation technologies (solar) that supply electricity to users for captive use/mini grid. The PoA, on the basis of CPAs included, reduces the anthropogenic emissions of greenhouse gases (GHGs) into the atmosphere from use of fossil fuel for electricity generation.

The proposed PoA is a voluntary coordinated action:

The proposed PoA will facilitate access to carbon revenues to renewable energy developers. The role of the CME to bring various CPAs in a common PoA is voluntary in nature and is not the result of any legal mandates within Vietnam. Likewise, no mandatory laws or regulations exist requiring

the CME or any other party to develop a PoA for solar PV based renewable generation plants in any host party. Thus, the proposed PoA is as a voluntary coordinated action by the CME.

Inclusion criteria for CPA based on additionality of the PoA:
With respect to the scale of a PV solar project (i.e., any CPA) could belong to one of the five cases identified in section A.1 in those PoA-DD.

With reference to the three CDM methodologies that could be used, the additionality demonstration tools that a CPA could use are:

Scale of CPA	CDM Methodology	CDM Tools (latest version at PoA registration)
Micro-scale	AMS-I.D (Version 18.0): Grid connected renewable electricity generation	TOOL 19: Demonstration of additionality of microscale project activities (Version 9.0)
Small-scale		TOOL 21: Demonstration of additionality of small-scale project activities (Version 13.0)
	AMS I.F (Version 3.0): Renewable electricity generation for captive use and mini-grid	TOOL 21: Demonstration of additionality of small-scale project activities (Version 13.0)
Micro-scale		TOOL 19: Demonstration of additionality of microscale project activities (Version 9.0)
Large-scale	ACM0002 (Version 20.0): Grid-connected electricity generation from renewable sources	TOOL 01: Tool for demonstration and assessment of additionality (Version 7.0) TOOL 02: Combined tool to identify the baseline scenario and demonstrate additionality (Version 7.0) TOOL 23: Additionality of first-of-its-kind project activities (Version 3.0) TOOL 24: Common Practice (Version 3.1) TOOL 27: Investment Analysis (Version 10.0)

The inclusion criteria for any CPA based on additionality requirements are described below.

Scenario 1: Automatic inclusion if 'additional' based on:

First-of-its-kind projects in the host country

When it can be demonstrated that a CPA meets the definition for 'First-of-its-kind ("FOIK") projects' in the context of its applicable geographical area/Host Country boundary, by using an electricity generation technology that is different from any other used in the same Host Party. In such cases, the crediting period will be limited to 10 years as per TOOL 23.

Any CPA using technologies in the positive list like Solar PV

Any large-scale CPA could apply automatic additionality criteria for 'Solar photovoltaic technologies' if relevant to the electricity grid in its Host Party.

Any micro-scale and any small-scale CPA would be 'automatically additional' for Solar PV as per criteria summarised in Appendix (Figure 1) in TOOL 19.

Scenario 2: Inclusion if meets 'Additionality Demonstration' criteria other than 'automatic additionality'

1. For any Micro-scale CPA, the demonstration of eligibility for inclusion shall be based on paragraphs 8.(a) and 8.(b) in TOOL 19. An assessment of de-bundling shall be performed as per paragraph 11 of TOOL 20. General guidelines to demonstrate the project capacity to be within 5MW threshold and prior consideration of CDM, shall also be demonstrated as per paragraphs 14 and 15, respectively, from TOOL 19.

2. For any Small-scale CPA, barrier analysis test shall be used to demonstrate whether at least one of the four barriers types, i.e., investment, technological, prevailing practice and any other, would have prevented the implementation of a CPA, as per paragraph 10 of TOOL 21.

3. **For any Large-scale CPA,** additionality demonstration shall be by applying TOOLs 01, 24 and 27 where relevant, as summarised below.

STEP 1: Identification of alternative scenarios to generate and supply similar level of electricity as the CPA

Step 1a: To define alternative scenarios to the CPA

Step 1b[2]: To check for consistency with mandatory applicable laws and regulations for the Host Party

STEP 2: Barrier Analysis to identify if any barrier could prevent implementation of the CPA but not any other plausible alternative scenario

Step 2a: To identify realistic and credible barrier(s) that could prevent implementation of alternative scenarios

Potential barriers could be as follows:

- Investment barriers other than insufficient returns
- Technological barriers

STEP 3: Investment Analysis to compare economic or financial attractiveness of the remaining alternative scenarios after STEP 2

- Benchmark Analysis

Or,

- Investment Comparison Analysis.

STEP 4: Common Practice Analysis after STEP 2 or STEP 3
To complement Step 2 and/or Step 3 as applied to any CPA for demonstrating if the CPA is a common practice in the relevant geographic area.

SECTION D. Start date and duration of PoA

D.1. Start date of PoA

>>
24/07/2018
(Date above is determined in accordance of when the Prior Consideration was published)

[2] Refer paragraph 24, 25 and 26 in TOOL 01.

D.2. Duration of PoA

>>
28 Years 0 month

SECTION E. Environmental impacts

E.1. Level at which environmental impacts analysis is undertaken

>>
Will be undertaken at the CPA Level.
(Not only is it in order to comply with national requirement on environmental management)

E.2. Analysis of environmental impacts

>>
Not Applicable.

E.3. Environmental impact assessment

>>
Not Applicable.

SECTION F. Local stakeholder consultation

F.1. Level at which local stakeholder consultation is undertaken

>>
Will be undertaken at the CPA Level.

Especially so for projects that have environmental and social impacts, consultation will not be a single conversation but a series of opportunities to create understanding about the project among those it will likely affect or interest, and to learn how these external parties view the project and its attendant risks, impacts, opportunities, and mitigation measures.
Additionally, given that the PoA will extend to other host countries with different scaled projects (large to micro), it is not feasible to conduct the local stakeholder consultation on a PoA level.

F.2. Modalities for local stakeholder consultation

>>
Not Applicable.

F.3. Summary of comments received

>>
Not Applicable.

F.4. Consideration of comments received

>>
Not Applicable.

SECTION G. Approval and authorization

>>
The CME obtained a letter of approval from DNA of Vietnam as host party on 16/03/2020. The DNA of Vietnam has confirmed that the PoA contributes to sustainable development in Vietnam.

PART II. Generic component project activity (CPA)

Case 1: Large-Scale Grid Connected CPAs (LGC)

SECTION H. Description of generic CPA

H.1. Title of generic CPA

>>
SUNSEAP Large-scale Grid connected CPA by {entity name} in [location]

H.2. Reference number of generic CPA

>>
CRX-SUNSEAP/[Country]/LGC-X,

where,
Country = Host Party
X = 1 and above.

For example, the 1st large scale CPA and if hosted in Vietnam will bear the reference number "**CRX-SUNSEAP/Vietnam/LGC-1**".

H.3. Purpose and general description of generic CPA

>>
[Insert CPA Title here] is a proposed Large-Scale Component CPA involves the installation of grid connected solar photovoltaic (Solar PV) power plant in **[insert location]**. The total installed capacity of the project activities under CPA is **[insert installed capacity (MWp)]** and is designed to contribute to the improvement of power output from renewable energy sources for **[insert Host Party regional location]** in particular and **[insert Host Party]** in general, contributing to affirm the responsibility of [Host Party] to the international community in environment protection.

CPA implementation time: From **[insert timeframe]**, detailed implementation plan is as follows:

No.	Article I. Works items	Expected completion time
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

The electricity generated by the CPA would displace equivalent amount of electricity generated by the operation of existing/ grid connected power plants (mostly fossil fuel-based power plants) and by addition of new generation sources into the grid. The CPA, thus, reduces the anthropogenic emissions of greenhouse gases (GHGs) into the atmosphere associated with the equivalent amount of electricity generation from the existing grid connected power plants (mostly fossil fuel) and by addition of new generation sources into the grid.

The CPA is expected to generate an average of **[insert calculated figure] MWh/year** which will result in the average emission reductions of **[insert calculated figure] tonnes** of CO2 every year.

In addition, the CPA will improve the socio-economic progress of each nation by generating employment opportunities as well as achieving several of the UN's Sustainable Development Goals of 2015.

Contribution of CPA to Sustainable Development:

The CPA contributes to the improvement in conditions of local areas near by the surroundings of the CPA and contributes to sustainable development through below mentioned factors.

Environmental well-being:

- The CPA, by using solar energy as the renewable energy source, replaces/displaces energy generated from fossil fuels and thereby avoiding emission of greenhouse gases (GHGs) and other gases like SOx, NOx and particulate matter.
- Encourage industrial development in the region and generate economic growth.

Economic well-being:

- Implementation of solar PV technology-based CPA under the PoA will result in employment opportunities for people involved with installation of renewable energy technologies.
- The implementation of CPA will also help in reducing demand-supply gap of electricity in the country.

Social well-being:

- The solar CPA involves generation of electricity utilizing solar PV technology without emitting GHGs into atmosphere. This reduces the adverse impact of GHG emissions leading to cleaner environment.
- The CPA will create the employment opportunities for the local people during the installation of the renewable energy.
- Sales of carbon credits generated by the CPA will result in increased foreign direct investment;

Technological well-being:

- The CPA will use environment friendly, inexhaustible and clean solar energy.
- It will create opportunities for skill improvement and technology penetration in the Host Party.

Location of CPA
[insert map of project location]

[Insert location and coordinates of project activity]

H.4. Technologies/measures

>>

The project will utilize solar energy to generate no GHG emissions electricity by PV array. The CPA involves the installation of [insert plant capacity (MWp)] solar power project in **[insert project location]**.It is estimated that the annual average net generating electricity of the CPA is **[Insert Calculated Figure]** MWh, taking account of significant related factors as solar cell array efficiency, inverter efficiency and AC gird-connected efficiency.

Solar energy collectors and converters are solar cell modules, which directly convert solar energy into direct current through the photovoltaic effect. Thanks to the inverters, the DC is converted into AC. A PV module consists of multiple solar modules connected, which can have capacity range from several dozen (W) to several tens of megawatts (MW). The inverter connected to each group will convert direct current (DC) into alternating current (AC). The post-converted power is supercharged to 110kV using transformers and exported to the Vietnamese national grid via load lines and electricity metering systems.
For PV modules manufactured for commercial purposes, the photovoltaic conversion efficiency of PV modules ranges from 14% to 20%.

A PV power production unit may in general constitute the following equipment:

- Solar PV array consisting of either:
  - Monocrystalline Solar Panels (Mono-SI)
  - Polycrystalline Solar Panels (p-Si)
  - Thin-Film: Amorphous Silicon Solar Panels (A-SI)
  - Concentrated PV Cell (CVP)
- Mounting structures (potentially also including tracking system)
- Junction box, distribution boxes and DC (direct current) cabling connecting modules with inverters
- Inverters
- Production meter on AC (alternating current) inverter output side (integrated to inverter)
- Data logger and/or gateway to internet (potentially integrated to inverter)
- Transformers
- Circuit breakers
- System for control and monitoring
- Grid utility meter
- Evacuation system / grid connection system

This technology is emerging as a plausible alternative in this country due to the following key factors:

- Increasingly insufficient and inadequate electricity supply to meet demand.
- Enhanced cost competitiveness of solar PV, being brought about not just through falling costs for PV equipment, but also the availability of climate finance to reduce the cost of capital.
- Shorter relative lead times associated with delivering projects compared to other capital-intensive generation technologies, including fossil fuel-based alternatives.

Need for diversification of energy supply options to reduce risks associated with reliance upon fossil fuel imports.

Electricity produced by the project activity will be monitored at the point it is exported to the grid. Equipment used in the project activity has an average lifetime of **[Insert CPA Lifetime here]** years.

The annual operation time of the proposed project is estimated to be about **[Insert total sun hours]** hours and the plant load factor (PLF) of the proposed project is **[insert PLF]** %, and an efficiency of **[insert efficiency]**%. The annual net grid-in electricity is estimated to be **[Insert calculated figure]** MWh which contributes to the reduction of GHG emission by replacing parts of the electricity supply by the **[insert Host party's energy board]**.

The baseline scenario of the proposed project is the same as the scenario prior to the start of implementation of the CPA. The electricity generated by the CPA will be transmitted to the main transformer of a newly built substation and then be connected into the grid.

The principal component of the CPA involves the Solar (PV) modules, inverters, transformers and electricity meters; further details are included below. The technical specifications of modules and inverters used for the CPA under the CPA are given below.

The key technical parameters of the main equipment are shown as follows:

[Insert PV modules, transformer, and inverter technical specification]

SECTION I. Application of methodologies and standardized baselines

I.1. References to methodologies and standardized baselines

>>

In case of large-scale projects, i.e. CPAs with total installed capacity > 15 MW, CDM methodology ACM0002 (Version 20.0) shall be applied together with applicable CDM tools referred to in the methodology.

CDM Methodology Title: ACM0002 Grid-connected electricity generation from renewable sources --- Version 20.0

Tools applied in conjunction with ACM0002:

- Tool to calculate the emission factor for an electricity system, Version 07
- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion, Version 03
- Tool for the demonstration and assessment of additionality, Version 07
- Combined tool to identify the baseline scenario and demonstrate additionality, Version 07

I.2. Applicability of methodologies and standardized baselines

>>

Each Large-Scale CPA under the PoA will meet the applicability conditions of ACM0002 as described below:

Applicability Conditions	Compliance Status
This methodology applies to project activities that include retrofitting, rehabilitation (or refurbishment), replacement or capacity addition of an existing power plant or construction and operation of a Greenfield power plant.	**Yes.** CPA under this PoA is the installation of a new grid connected renewable energy power plant (solar PV) and hence this condition is met.
This methodology is applicable to grid-connected renewable power generation project activities that: a) install a Greenfield power plant b) involve a capacity addition to (an) existing plant(s) c) Involve a retrofit of (an) existing operating plants/units; d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or e) Involve a replacement of (an) existing plant(s)/unit(s).	**Yes** Any CPA under this PoA is installation of a new grid connected renewable energy power plant (solar PV) at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant) and hence this criterion is applicable.
The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;	**Yes** The proposed CPA under this PoA will be an installation of a new grid connected renewable energy power plant (solar PV) and hence this first condition is met. The proposed CPA under PoA does not involve any capacity additions, retrofits or replacements and therefore this second condition is not applicable.
In case of hydro power plants, one of the following conditions shall apply: a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or b) The project activity is implemented in existing single or multiple reservoirs,	**Not applicable.** The proposed CPA under the PoA does not involve any type of hydro power, therefore it is not applicable.

where the volume of the reservoir(s) is increased and the power density, calculated using equation (7), is greater than 4 W/m2 ; or c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (7), is greater than 4 W/m2 ; or d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (7), is lower than or equal to 4 W/m2 , all of the following conditions shall apply: i) The power density calculated using the total installed capacity of the integrated project, as per equation (8), is greater than 4 W/m2; ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m2 shall be: (1) Lower than or equal to 15 MW; and (2) Less than 10 per cent of the total installed capacity of integrated hydro power project.	
In the case of integrated hydro power projects, project proponent shall: a) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or b) Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore, this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum of five years prior to	**Not applicable** The proposed CPA under the PoA does not involve any type of hydro power, therefore it is not applicable.

the implementation of the CDM project activity.	
The methodology is not applicable to: (a) Project activities that involve: • Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site • Biomass fired power plants/units	**Not applicable.** The CPA under PoA will be installation of a new grid connected renewable energy project (Solar PV) and does not involve switching from fossil fuel to renewable energy and hence this criterion is not relevant to the PoA. This PoA does not involve any biomass-based power plants and hence this criterion is not applicable to the project activity.
In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	**Not applicable.** The CPA under PoA will be a new grid connected renewable energy plant (Solar PV) and not a retrofit, replacement or capacity additions and therefore this criterion is not applicable to the project activity.
In addition to the requirements set out in the latest approved version of the "Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities", the following shall be applied for the use of this methodology in a project activity under a programme of activities (PoAs).	**Not applicable.** The 'Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities' is obsolete and has since merged with the PoA-PS, which the PoA-DD adheres to.
The PoA may consist of one or several types of CPAs. CPAs are regarded to be of the same type if they are similar with regard to the demonstration of additionality, emission reduction calculations and monitoring. The coordinating/managing entity (CME) shall describe in the CDM-PoA-DD for each type of CPAs separately	**Yes.** The PoA only consists of one technology which is Solar PV. CPAs will be regarded to be of the same type if they are similar with regards to the demonstration of additionality, emission reduction calculations and monitoring. The only differentiation will be for the small-scale and micro-scale CPAs, which would only differ in terms of demonstration of additionality, where the project activities are deemed automatically additional.
Eligibility criteria for CPA inclusion used for each type of CPAs. In case of combinations of renewable technologies in one CPA, the eligibility criteria shall be defined for each technology separately. (a) Emission reduction calculations for each type of CPAs; (b) Monitoring provisions for each type of CPAs.	**Not Applicable** The CPA under the PoA will only consist of one technology (Solar PV), therefore this criterion is not applicable to the PoA and any CPA to be included.
The CME shall describe transparently and justify in the CDM-PoA-DD which CPAs are regarded to be of the same type. CPAs shall not	**Not Applicable**

be regarded to be of the same type if one of the following conditions is different: a) The project activity with regard to any of the following aspects: **(i) Renewable energy power generation technology;** a. Hydro-power plant/unit; i. Hydropower plant/unit with reservoir; ii. Hydropower plant/unit without reservoir; b. Wind power plant/unit; c. Geothermal power plant/unit; d. Solar power plant/unit; i. Photovoltaic; ii. Heat concentration; e. Wave power plant/unit; f. Tidal power plant/unit; g. Combination of any of the above; **(ii) Project activity type:** a. Greenfield; b. Capacity addition; c. Retrofit of existing operating plant/unit; d. Rehabilitation of existing plant/unit; e. Replacement of existing plant/unit; b) The legal and regulatory framework; (i) Legal regulations; (ii) Promotional policies	The CPA will be regarded to be of the same type unless one the conditions [3] referenced in ACM0002 Ver20.0, Section 5.9, Para 60(a) – (b) are different. As the CPA under the PoA only consists of greenfield Solar power plant/unit (Photovoltaic) technology, all CPAs under this PoA will be considered the same with respect to technology (Solar PV).
When defining eligibility criteria for CPA inclusion for a distinct type of CPAs, the CME shall consider relevant technical and economic parameters, such as: a) Technical and economic parameters that are technology specific (e.g. ranges	**Yes** The CPA under the PoA will consider/analyse all technical and economic parameters with respect to large-scale CPAs. The CPA will also consider parameters reflecting the investment climate and ranges of

[3] Conditions refer to: Renewable energy power generation technology, Project activity type and the legal and regulatory framework as per ACM0002 Ver20.0, Section 5.9, Para 60(a).

of load factors, sizes of installation, wind speed); b) Parameters reflecting the investment climate: (i) Subsidies or other financial flows; (ii) Tariffs; (iii) Depreciation; (iv) Power purchase agreements; (v) Other parameters determining market circumstances; c) Ranges of costs (capital investment, operating and maintenance costs, etc.) and revenues (income from electricity sale, subsidies/fiscal incentives, official development assistance (ODA)).	cost, under its investment analysis, when demonstrating additionality.
If Option (ii) in the latest approved version of the "Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programmes of activities" is applied, that is related to defining technical and economic criteria as ranges of values for each input parameter required for the inclusion of the CPA in the PoA-DD, the eligibility criteria related to costs, revenues and investment climate shall be updated every two years in order to correctly reflect the technical and market circumstances of a CPA implementation.	**Not Applicable** The PoA will instead follow Option (i) where it will conduct an investment analysis to each CPA. In this case, the CME will define the input parameters that will be used in the investment analysis in the PoA, together with a description of how the values for these parameters will be obtained. The additionality of the CPA will be assessed by using the actual values, applicable to the CPA at the time of inclusion, for the purpose of demonstrating the additionality of the CPA.

Applicability conditions of "Tool to calculate the emission factor for an electricity system"	
Applicability Conditions	**Compliance Status**
This tool (as referenced in TOOL 7, Ver 7may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).	This condition is applicable. OM, BM and CM are estimated using the tool for calculating baseline emissions, using electricity grid information in the country where the CPA will be implemented.
Under this tool (as referenced in TOOL 7, Ver 7.0 paragraph 4), the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, two sub-options under the step 2 of the tool are available to the project participants, i.e. option IIa and option IIb. If option IIa is chosen, the conditions specified in "Appendix 1: Procedures related to off-grid power generation" should be met. Namely, the total	Since the CPA under PoA activity is grid connected (solar PV), this condition is applicable, and the emission factor has been calculated accordingly.

capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	
In case of CDM projects (as referenced in TOOL 7, Ver 7.0 paragraph 5) the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	CPA under PoA will be located within the boundary of Vietnam, that is excluded from the list of Annex I countries. Therefore, this criterion is not applicable for the project activity.
Under this tool (as referenced in TOOL 7, Ver7.0 paragraph 6), the value applied to the CO2 emission factor of biofuels is zero.	Each CPA under PoA will be grid connected renewable energy project (solar PV) and CO2 emission factor is not considered for biofuels.

I.3. Application of multiple methodologies

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ACM0002 (in its latest version at the time of PoA registration) is the only methodology applied to this CPA.

I.4. Project boundary, sources and greenhouse gases (GHGs)

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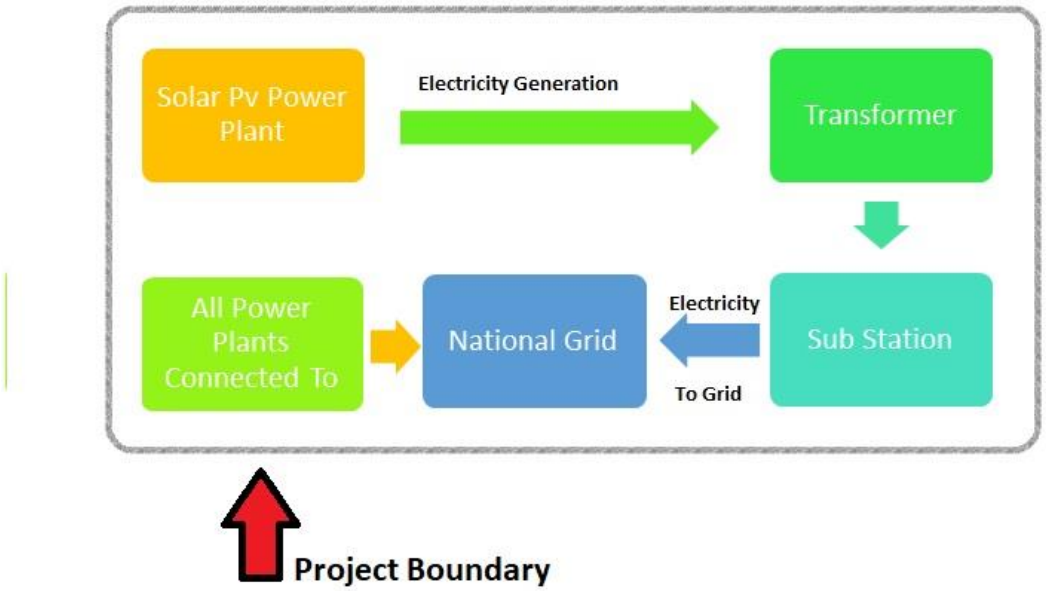
Project boundary has been ascertained using para 20 of ACM0002 (Version 20.0, EB 100) –

“The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the power plant in the CPA is connected to”.

Hence the project boundary includes the renewable energy power plant, sub-stations, grid and all power plants connected to grid. The proposed CPA will evacuate power to the grid.

The calculation of net electricity supplied to grid is under purview of Electricity Regulatory Authority of the Host Party that is applicable to the CPA, and CPA Owner or CPA Implementer does not have any control on it. Thus, for the CPA, net electricity supplied to the applicable grid within the project boundary is a monitoring parameter which is used for ER calculations.

The schematic representation of project boundary for grid connected CPAs is represented as below:



	Source	GHG	Included?	Justification/Explanation
Baseline	CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the CPA.	CO_2	Yes	Major emission sources.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
		---	---	---
Project activity	CO2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	CPA does not involve solar thermal or geothermal power plants. Hence not applicable.
		CH_4	No	CPA does not involve solar thermal or geothermal power plants. Hence not applicable.
		N_2O	No	CPA does not involve solar thermal or geothermal power plants. Hence not applicable.
		---	---	---

I.5. Establishment and description of baseline scenario

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As per the approved consolidated methodology ACM0002, Version 20 para 22:

If the project activity is the installation of a Greenfield power plant, the baseline scenario is the following:

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system"

The project activity would replace the weighted average of the ratio of emissions in the system represented by:

a) **Operating Margin (OM)**
The ratio of all power generating projects in the defined system over the latest three-year period excluding least cost/must run projects.

b) Build Margin (BM)
The generation-weighted average emission factor of all power units *m* during the most recent years *y* for which power generation data is available.

c) **Combined Margin (CM)**
Default values established in the 'Tool to calculate the emission factor of an electricity system' for the weighting of the OM (W_{om}=75%) and for the weighting of the BM (W_{BM}=25%).[4]

Variables	Values	Source
Operating Margin Emission Factor	0.8795 tCO_2/MWh	Ministry of Natural Resources and Environment Vietnam (Most updated Figure)[5]
Build Margin Emission Factor	0.9465 tCO_2/MWh	
Combined Margin Emission Factor	0.89625 tCO_2/MWh	Calculated as section below

During the last 25 years Vietnam's economic growth reached more than 6% each year. At the same time, the energy demand increased almost twice as fast as the GDP. With an expected continuous increase of energy demand in the next years, Vietnam's energy sector will have to face many challenges, such as limited domestic fossil resources, air pollution and climate change, causing amongst other things water scarcity. Vietnam has been ranked among the five countries, that will be most affected by climate change.

Another issue is the country's unreliable power supply, especially in rural areas. In order to face these challenges, legislative conditions have to be adopted and the framework conditions for investments have to be reformed to strengthen foreign investments and eventually stimulate the expansion of renewable energy generation capacity.

In relation to the first CPA-DD in Vietnam, Vietnam's GHG mitigation activities prior to 2020 as stated in its INDCs, 'Viet Nam's INDC identifies the GHG reduction pathway in the 2021-2030 period. With domestic resources GHG emissions will be reduced by 8% by 2030 compared to the Business as Usual scenario (BAU). The above-mentioned contribution could be increased up to 25% with international support.'.

The CPA involved setting up of renewable energy technology (solar PV) to produce electricity and supply to the grid. In the absence of the CPA, the equivalent amount of electricity would have been supplied by the country's National grid, which is fed mainly by fossil fuel fired plants.

In the absence of the CPA, the equivalent amount of electricity would have been drawn from the state grid. Hence, the baseline for the CPA is the equivalent amount of power from the respective country's National Grid.

[4] As per Tool 7: Tool to calculate the emission factor for an electricity system Ver.7.0, Section 6.6.1 Para 86 (a)

[5] Grid emission factor for Vietnam, 2020, http://dcc.gov.vn/van-ban-phap-luat/1059/Nghien-cuu,-xay-dung-he-so-phat-thai-(EF)-cua-luoi-dien-Viet-Nam-(K%C3%A8m-CV-263/BDKH).html

I.6. Estimation of emission reductions

I.6.1. Explanation of methodological choices

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As per para 39 of ACM0002 Version 20.0, Baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the CPA. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$

Where,

BE_y	=	Baseline Emissions in year y; (tCO2 /yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM CPA in year y (MWh/yr)
$EF_{grid,CM,y}$	=	Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO2/MWh)

As per para 41 of ACM0002 version 20.0,
If the CPA is the installation of a Greenfield power plant, then:

$$EG_{PJ,y} = EG_{facility,y}$$

Where:

$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM CPA in year y (MWh/yr)
$EG_{facility,y}$	=	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

As per methodology, combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO2/MWh), Version 7.

The combined margin ($EF_{grid,CM,y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) and build margin (BM). Calculations for this combined margin must be based on data from an official source.

Calculation emission factors of the Vietnamese national grid $EF_{grid,CM,y}$

For solar power plants, emission factors are calculated using:

- Most updated national data: Data on Vietnamese national grid emission factors published by Vietnam DNA, Department of Climate Change, Ministry of Natural Resources and Environment with official letter No. 263/BDKH on 12 March 2020 on "Vietnam grid emission factor 2018"
- The most updated emission factor calculation tool: Version 07.0 of the "Tool to calculate emission factor for an electricity system"

Emission factor of Vietnamese national grid is calculated and published by Vietnam DNA, Department of Climate Change, Ministry of Natural Resources and Environment (Official Dispatch No. 263/BDKH dated 12 March 2020), including:

Variables	Values	Source
Operating Margin Emission Factor	0.8795 tCO_2/MWh	Ministry of Natural Resources and Environment Vietnam (Most Updated Figure) [6]
Build Margin Emission Factor	0.9465 tCO_2/MWh	

The combined margin emissions factor is calculated as follows:
$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$
In which:

- $EF_{grid,CM,y}$ = Combined margin CO2 emission factor of Vietnamese national grid in year y (tCO2/MWh)
- $EF_{grid,OM,y}$ = Operating margin CO2 emission factor of Vietnamese national grid in year y (tCO2/MWh)
- w_{OM} = Weighting of operating margin emissions factor (%)
- $EF_{grid,BM,y}$ = Build margin CO2 emission factor of Vietnamese national grid in year y (tCO2/MWh)
- w_{BM} = Weighting of build margin emissions factor (%)

However, the report of the DNA of Vietnam applying the weighting of margin emission factor and build margin emission factor is 0.5, this weighting is not applicable to solar power plants. According to version 07.0 of the "Tool to calculate the emission factor for an electricity system", the following default weights are applied to solar power plants:
w_{OM} = 0.75 and w_{BM} = 0.25

Therefore, the combined margin emissions factor for solar power plants are calculated as follows:
$EF_{grid,CM,y}$ = 0.75 x 0.8795 + 0.25 x 0.9465 = 0.89625 (tCO2/MWh)

The value fixed for the first crediting period will be **0.89625 tCO_2/MWh** with no need to update. This combined margin emission factor will remain fixed for first crediting period of this PoA and will be updated during second and third crediting period.

Project Emissions: For most renewable power generation projects activities PE_y =0. As per applied methodology only emission associated with the fossil fuel combustion due to release of non-condensable gases, should be accounted for the project emission.

Leakage Emissions: No Leakage emissions are considered. The main emission potentially giving rise to leakage in the context of electrical sector projects is emission arising due to activities arising such as power plant construction and upstream emission from fossil fuel use (e.g. extraction, processing, and transport). These emission sources are neglected.
Hence, LE_y= 0

Emission reduction (ERy): The CPA mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plant by renewable electricity. The emission reduction ERy by the CPA during a given year y is the difference between Baseline emission and Project emission & Leakage emission.

Thus, as per equation 17 of ACM0002 Version 20,

$$ER_y = BE_y - PE_y$$

where,

[6] Vietnam's Grid emission factor for Vietnam, 2020, http://dcc.gov.vn/van-ban-phap-luat/1059/Nghien-cuu,-xay-dung-he-so-phat-thai-(EF)-cua-luoi-dien-Viet-Nam-(K%C3%A8m-CV-263/BDKH).html

ERy = Emission Reduction in year (tCO2e/year)
BEy = Baseline emissions in year (tCO2e/year)
PEy = Project emissions in year (tCO2e/year)

In those CPAs where no back-up power or auxiliary consumption is procured from fossil fuel-based energy sources within the CPA's project boundary, PEy = 0.

I.6.2. Data and parameters fixed ex ante

Data/Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2/MWh
Description	Operating Margin CO_2 emission factor in year y
Source of data	The most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, issued on Mar 2020.
Value(s) applied	0.8795
Choice of data or Measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0.0" as 3-year generation weighted average using data for the years. The data are obtained the most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, dated Mar 2020
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire first crediting period as stated, therefore value is provided above.

Data/Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2/MWh
Description	Build Margin CO2 emission factor in year y
Source of data	The most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, issued on Mar 2020.
Value(s) applied	0.9465
Choice of data or Measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0.0". The data are obtained the most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, dated Mar 2020
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire first crediting period as stated, therefore value is provided above.

Data/Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined Margin CO2 emission factor in year y
Source of data	The most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, issued on Mar 2020.
Value(s) applied	0.89625
Choice of data or Measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0.0". The data are obtained the most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, dated Mar 2020
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire first crediting period as stated, therefore value is provided above.

I.6.3. Modalities for ex ante calculation of emission reductions

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Thus, as per equation 17 of ACM0002 Version 20.0, Formula used to calculate the net emission reduction for the CPA is:

$$ER_y = BE_y - PE_y$$

Where,
ER_y = Emission Reduction in year (tCO2e/year)
BE_y = Baseline emissions in year (tCO2e/year)
PE_y = Project emissions in year (tCO2e/year)

Baseline Emission (BE_Y)

The baseline emissions are the product of electrical energy baseline $EG_{facility,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by an emission factor.

$$BE_Y = EG_{facility,y} * EF_{grid,CM,y}$$

Where,
$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

CPA Investor's Name	Capacity	PLF (%)	Generated Power (MWh) p.a	Baseline Emission Factor (tCO2/MWh)	Baseline emissions (tCO2/ year)

$EF_{grid,CM,y}$ = Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO2/MWh).

$BE_y = EG_{BLy} \times EF_{CO2,y}$
Where
- BE_y = Baseline emissions in year y (t CO2)
- EG_{Bly} = Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year y (MWh)
- $EF_{CO2,y}$ = Emission factor (t CO2/MWh)

BE_y = xxxx * xxxx = xxxx

As per Section I.6.1:
$PE_y = 0$
$LE_y = 0$

Thus,
$ER_y = BE_y - PE_y - LE_y$
$ER_y = BE_y - 0 - 0$
$ER_y = BE_y$

Therefore,
ER_y = **xxxx**

I.7. Monitoring plan

I.7.1. Data and parameters to be monitored

Data/Parameter	$EG_{PJ,,y}$ or $EG_{facility,y}$
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)
Source of data	Credit Report /JMR as per Monthly Generation Report
Value(s) applied	XXX (Actual monitored Value from electricity sold invoice, specific to CPA)
Measurement methods and procedures	Data Type: Measured and Calculated Monitoring equipment: Electronic tri-vector and Bi-directional Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: One in two years Electricity exported/imported to the grid is in kWh. However, for the calculation purpose electricity exported is converted in MWh. The Bi-directional energy meter measures both export and import of CPA. The Net electricity supplied to the grid by the CPA will be calculated as a difference of electricity exported to the grid, electricity imported from the grid obtained from joint meter reading certificates/credit notes issued by the Electricity regulatory Authority of the Host Party as per below equation: $EG_{PJ,,y} = EG_{Export} - EG_{Import}$ The joint reading at metering point is carried out once in a month in presence of O&M officials and Electricity Regulatory Authority personnel. The calculations/measurement of net electricity supplied to grid is under purview of the respective country's group energy/electricity regulatory board and the CPA Owner will get value of net electricity supplied to grid and hence this parameter is mentioned as a part of monitoring plan. Cross Checking: Quantity of net electricity supplied to the grid will be cross checked from the invoices raised by the respective country's Electricity Regulatory Authority or invoices with third party.
Monitoring frequency	Monthly
QA/QC procedures	The calibration of all the meters will be undertaken at required intervals and faulty meters will be duly replaced immediately. The meters will be of accuracy class 0.2s or 0.5s. The meter accuracy class and calibration interval are under purview of the respective country's group energy/electricity regulatory board and CME/CPA owner do not have any control on it. It is also noted that apportioning procedure (if applicable for CPA) is under control of the respective country's group energy/electricity regulatory board and PP do not have any control on it. The available parameter to CME/CPA owner is the net electricity supplied to grid and same parameter is mentioned as monitoring parameter. Wherever possible, the net electricity supplied to grid can be compared with project site meters (controller meter) data.
Purpose of data	The Data/Parameter is required to calculate the baseline emission
Additional comment	Data will be archived electronically for a period of 2 years beyond the end of crediting period.

I.7.2. Sampling plan

N/A

I.7.3. Other elements of monitoring plan

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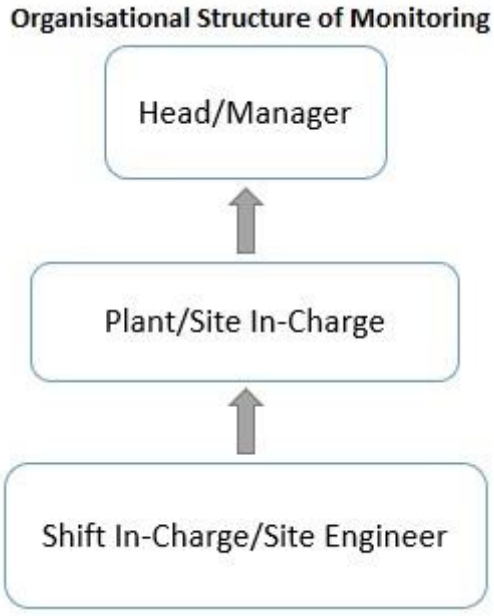
The monitoring plan is developed in accordance with the modalities and procedures for CDM project activities and is proposed for grid-connected renewable energy power project (Solar PV) being implemented within Vietnam. The monitoring plan, which will be implemented by the CME describes about the monitoring organisation, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage and archiving.

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data results with the CME. CME proposed the following structure for data monitoring, collection, data archiving and calibration of equipment for this CPA. The team comprises of the following members:



CME has assigned the responsibility of operation and maintenance of CPA with relevant and authorised O&M contractors. The Plant In-charge and Shift In-Charge would be deployed by O&M contractors.

Organizational Structure for monitoring:

Designation	Responsibilities
Head / Manager	• Overall functioning and maintenance of the CME • Holds complete control over monitoring aspects pertaining to the project
Plant / Site In-Charge	Maintains the data records, reliability of data (calibration of equipment) and ensures completeness of data such as: • Recording • Verification • Storage of Data
Shift In-Charge / Site Engineer	Responsible for day to day maintenance of: • Data collection • Logbook for monitored data • Storage of Data

The CPA having dedicated metering which directly measures quantity of net electricity supplied and same is considered for ER calculations. For CPA having common metering, the apportioning

procedure will be followed as mentioned below to determine the parameter net electricity supplied to grid.

For CPAs which involves apportioning procedure due to common metering arrangement for solar projects:

In case of common metering arrangement, the CPA have monitoring system at project site/pooling station and at substation.
The metering is carried out at the substation via a common meter for a group of solar PV projects that is inclusive of the project activity and other than project activity.

The primary monitoring is done through a main meter which is located at the substation. Also, each project activity measures electricity at project site/pooling station.

Only the final apportioned electricity export and import for each project would be reported by national electricity board or by O&M service providers and endorsed by national electricity board in the JMRs. JMRs are taken at the substation level by the local electricity utility. Against the net electricity generation invoices are raised.

O&M service providers maintain all the individual project activity readings at projects site. After recording the Joint Meter values every month, in presence of the National Electricity Board personnel, O&M contractor apportions the generation values for each of the project activity accordingly (based on the project site/pooling station electricity data).

The apportioning of electricity export and import for each project activity is derived from project site/pooling station data. The net electricity generation from each project activity is determined as follows:

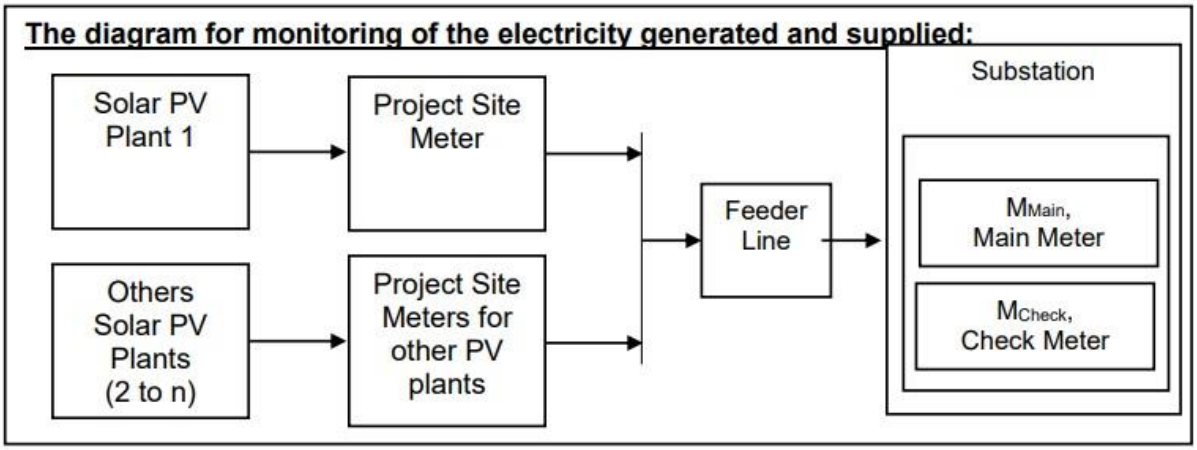
$EG_{PJ,y} = EG_{project\ site\ CPA}$ X Total $(EG_{export} – EG_{import}) / EG_{project\ site,\ total}$

Where,

$EG_{PJ,y}$ = Quantity of net electricity supplied to the grid from the CPA
Total $(EG_{export} - EG_{import})$ = Total net export value of all project activity connected to substation
$EG_{project\ site\ CPA}$ = electricity generation at project site/pooling station by CPA
EG_{import} = Total import at sub station
EG_{export} = Total export at sub station
$EG_{project\ site,}$ total = Total electricity generation at project site/pooling station of all project activities which are connected to sub station

In general, for apportioning the common meter export/import reading at substation and ratio of respective project activity reading to all power plants (inclusive of project activity and other than project activity) reading will be used.

The schematic representation of common metering is represented as below:



In case of dedicated metering, CPA will have dedicated meters and there is no common metering involved.

The export and import of respective CPA can be determined separately by using above formula with consideration of only export or import of substation as applicable.

The above apportioning procedure (in case of common metering) will be according to Vietnam's regulations and may not be within the control of the CPA Owner or CPA Implementer. The above procedure involves two stage metering (controller/project site meter data and substation meter data). Net electricity supplied to grid will be calculated accordingly.

Since there is variation in apportioning procedure from country to country, specific CPA will mention such apportioning procedure (if applicable) based on location of CPA.

QA & QC Procedures to be followed

Necessary check meters as required would be installed, to operate in standby mode or when the main meters are not working. All meters will be calibrated at least once in two year as per CPA notification. Records of calibration certificates will be maintained for verification. Hence, high quality is ensured with the above parameters. The calibration of meters is under purview of national electricity board and CME/CPA owner do not have any control on it.

Data Recording and Storage

For measuring the net energy supplied to grid by the CPA at the interconnection point, one set of Main meter and Check Meter shall be provided. Representatives of both CME/CPA Owner and National Utility will be present to record the monthly meter readings. The National utility will prepare the credit report for the net energy supplied to the grid and same will be used as a basic document for monitoring and verification of the net energy supplied to the grid. Based on the monthly credit report, the CME/CPA Owner shall raise an invoice to the utility. Utility will pay to the CME/CPA Owner based on this document. The above document will be kept at safe storage for verification of emission reductions generated from the project activity. The period of data storage will be 2 years beyond crediting period.

Emergency preparedness

The project activity will not result in any unidentified activity that can result in substantial emissions from the project activity. However, in case monitoring equipment get failed or found faulty, they shall be replaced with calibrated meters as quickly as possible. In case main meter get failed or found faulty, the reading of check meter will be considered.

Personnel training

In order to ensure a proper functioning of the CPA and a properly monitoring of emission reductions, the staff will be trained. The Shift In-charge and Plant In-charge will be trained in equipment operation, data recording, operation and maintenance and emergency procedures in compliance with the monitoring plant.

SECTION J. Crediting period type and duration

>>

7 years and renewable 3 times equating to 21 years or 252 months.

SECTION K. Eligibility criteria for inclusion of CPAs

>>

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion
1	Geographical boundaries of CPAs consistent with the geographical boundary of the PoA;	The geographical boundary of the CPA area is uniquely defined and within the boundary of Vietnam.	• feasibility study report or • third party PLF assessment report or • land documents, or • commissioning certificates, or • permission from regulatory authorities or • Relevant equivalent document
2	Conditions to avoid double counting of GHG emission reductions or net anthropogenic GHG removals	The CPA is not part of any other PoA or will not be registered as individual CPA under any other emission reduction scheme or programme, or deregistered CDM project activity	• Inclusion Contract • and cross-checked on UNFCCC website by CME • CPA implementer confirmation
3	Conditions to confirm that CPAs are neither registered as CDM project activities, included in another registered PoAs, nor the project activities that have been deregistered;	The CPA is not part of any other PoA or will not be registered as individual CPA under any other emission reduction scheme or programme, or deregistered CDM project activity	• Inclusion contract • Cross-check on UNFCCC project cycle • CPA implementer confirmation

4	Specification of the technology/measure	Technology for solar PV array use for CPAs consisting of either: - Monocrystalline Solar Panels (Mono-SI) - Polycrystalline Solar Panels (p-Si) - Thin-Film: Amorphous Silicon Solar Panels (A-SI) - Concentrated PV Cell (CVP) The Solar PV system will include: -Mounting structures (potentially also including tracking system) -Junction box, distribution boxes and DC (direct current) cabling connecting modules with inverters -Inverters -Production meter on AC (alternating current) inverter output side (integrated to inverter) -Data logger and/or gateway to internet (potentially integrated to inverter) -Transformers -Circuit breakers -System for control and monitoring -Grid utility meter Evacuation system / grid connection system The capacity range of Case 1's entire system will be >15MW. Electricity produced by the project activity will be monitored at the point it is exported to the grid. The technology shall have Approval / certification from the relevant designated authority. All the equipment of each CPA will be complying with applicable national/ international standards.	• Inclusion contract • Feasibility study report or • Offer from the party providing the equipment / construction / operation services proving that the CPA is greenfield CPA. • Power Purchase Agreement / Wheeling Agreement or the • Approval from the relevant local authority or Purchase Orders /Work Order / contract with party Providing equipment / construction /operation services. CPA-DD
5	Conditions to check the start dates of CPAs through documentary evidence;	The CPA only started after the start date of the PoA. The start date of the PoA is considered as **24/07/2018** which is the intimation of prior CDM consideration to UNFCCC & the relevant country's' DNAs. Therefore, start date of the CPA must be later than 24/07/2018	• Purchase orders/contracts for equipment or construction/operation services or any other documents as stated in the Glossary of CDM terms

6	Conditions to ensure compliance with the applicability of the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents;	Project Activity will comply with applicability conditions of ACM0002 (ver 20.) where it will: 1. Be an installation of a Greenfield Power Plant 2. Include only Solar PV technology 3. Energy Generated will be grid-connected 4. Be of plant capacity > 15MW	• Inclusion contract • Feasibility study report or • Offer from the party providing the equipment / construction / operation services proving that the CPA is greenfield CPA. • Power Purchase Agreement / Wheeling Agreement or the • Approval from the relevant local authority or Purchase Orders /Work Order / contract with party Providing equipment / construction /operation services. • CPA-DD
7	Conditions related to undertaking local stakeholder consultation and environmental impact analysis;	The CPA shall conduct a local stakeholder consultation and environmental impact assessment according to local regulation. This will be reviewed by CME at CPA level	• Inclusion contract • Environmental impact assessment report • Environmental impact assessment approval • Minutes of meeting of local stakeholder consultation, • attendance records, invitation letters etc.
8	Conditions to provide an affirmation that funding from Annex I Parties, if any, does not result in a diversion of official development assistance.	The CPA does not involve funding from Annex I parties that results in a diversion of official development assistance.	• Undertaking from CPA Owner or CPA Implementer.
9	Target group (e.g. domestic/commercial/industrial, rural/urban, grid-connected/off grid), and where applicable, distribution mechanisms (e.g. direct installation);	The CPA supplies electricity to the national/regional grid or uses national grid for captive or third-party sale	• Power Purchase Agreement • Grid Evacuation approval/agreement • Wheeling Agreement, or • DPR or CPA

10	Condition to ensure the CPA meet the requirement for demonstration of additionality.	The CPA is additional according to additionality assessment of ACM0002. Additionality will be proven on a per CPA basis. If the investment analysis is used for the demonstration of additionality, the project activity will define the input parameters that will be used in the investment analysis is as the table below. The additionality of each CPA shall then be assessed by using the actual values, applicable to that CPA at the time of inclusion, in the investment analysis conducted for the purpose of demonstrating the additionality of the CPA. Project and Equity IRR are also to be within the range of 8-12%. This range of IRR is a typical for solar PV investments in the region.	• Applied methodology ACM0002, • Detailed Project Report prepared by third party / submitted to banks for financing, or • Clearances

Investment Analysis

The investment analysis shall be performed in order to determine whether the proposed project activity is not:

a) The most economically or financially attractive; or
b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

Determining appropriate analysis method:

In order to determine the appropriate analysis method, the following options are available to be used in the additionality analysis:

- Option I - Apply simple cost analysis,
- Option II - Apply investment comparison analysis,
- Option III - Apply benchmark analysis.

As the project activity generates financial or economic benefits other than CDM related income, then the investment comparison analysis (Option II) or the benchmark analysis (Option III) will be used.

Financial indicator calculations will be done using a financial model based on a list of economic parameters provided by the CPA implementing agency and in accordance with Methodological tool “Investment analysis”. This list of parameters as applicable would include the following:

Details Input parameters of the CPA		Source
Investment decision made date		Board resolution
State where the project is situated		Offer or Board resolution
Total Capacity of CPA(MW)		DPR, or offer or Board resolution

Expected Date of Commissioning		Assumption or DPR
Life of the plant (Yrs.)		As per manufacturer specifications or tariff order or as per Tool to determine the remaining lifetime of equipment
Generation of Electricity		
PLF (%)		Publicly available data or third party PLF report or PLF as per CDM EB guidance “Guidelines for the reporting and validation of plant load factors”.
Annual generation (kWh)		Calculated Value
Tariff rate at the decision making		Tariff order, or PPA or Electricity Bills
Escalation in Tariff (if applicable)		Tariff order, or PPA or Electricity Bills
Revenues (If applicable)		To be included in the calculation only if applicable to CPA and not covered under tariff. This could be Generation Based Incentive from Indian Renewable Energy Development Agency Ltd. (IREDA) or any other revenue as per state/national regulatory policies applicable on the date of investment decision.
Subsidy (If applicable)		National or state-specific policy applicable for solar or hydro or wind technologies
Operation and maintenance cost and Insurance		
O & M Expenses		DPR or offer or tariff order
Escalation in the operational expenses (%)		DPR or offer or tariff order
O & M free for (Yr.)		DPR or offer or tariff order
Administrative expenses		Administration and Miscellaneous expenses worked out by PP during investment decision, PP

		estimation or DPR or tariff order
Escalation in Administrative expenses		Escalation for Admin Expenses PP estimation or DPR or tariff order
Insurance		PP estimation or DPR, or offer or tariff order
Financial Parameters		
TOTAL COST		DPR or offer or tariff order
Loan Amount		DPR or offer
Equity Investment		DPR or offer
Term Loan		
Loan Amount		DPR or offer
Interest rate (%)		
Loan Tenure (Qtr.)		
Moratorium Period (Qtr.)		
Repayment Period (Qtr.)		Calculated Value
Repayment instalments value		Calculated Value
1st instalment from (Qtr. end)		Considered from the next Quarter End
Book Depreciation (SLM Method)		
Land		DPR or offer
Gross Depreciable Value		Calculated Value
Salvage Value (%)		DPR or offer or tariff order
Salvage value		Calculated Value
Net Depreciable Value		Calculated Value
Residual Value		Calculated Value
Income Tax		
Financial Year		
Income tax rate (%)		As Per Income Tax Rule
MAT (%)		As Per IT rule
Service Tax (%)		As Per Income Tax Rule
Surcharge (%)		As Per Income Tax Rule
Education cess (%)		As Per Income Tax Rule
Final Tax Rates		
Income tax rate (%)		Calculated Value
MAT (%)		Calculated Value
Service Tax (%)		Calculated Value

If required by the eligibility criteria provided above for inclusion of a proposed CPA in PoA, the Benchmark Analysis would be conducted as follows:

A financial indicator (project IRR or equity IRR) would be chosen for the proposed CPA and justification for its selection would be provided. The IRR in nominal terms will be applied for CPA. Subsequently, a benchmark would be adopted which is appropriate to the type of financial indicator calculated and could be chosen as either of the following:

Financial Indicator	Benchmark options

Equity IRR	Any one option from below: a. Default value for the expected return on equity for the respective country as per the Methodological tool "Investment analysis" (increased by applicable inflation as financial indicator is calculated in nominal terms) Or b. Government/official approved benchmark where such benchmarks are used for investment decisions
Project IRR	Any one option from below: a. Local commercial lending rates applicable in the country (pre-tax rate used in case of pre-tax IRR) – The Prime lending Rate (PLR) of the respective country's state/national bank will be considered for local commercial lending rates. RBI is the relevant national authority for its statistical database and same will consider for PLR value. Or b. Weighted Average Costs of Capital (WACC) calculated as: WACC= {D/(D+E)}*{1-T/100}*Cost of Debt + {E/(D+E)}*Cost of Equity (tax-rate not applied in case of pre-tax IRR) Where, Cost of Debt is determined as local commercial lending rate applicable in the country. The Prime lending Rate (PLR) of Reserve Bank of India (RBI) will be considered for local commercial lending rates. RBI is the relevant national authority for its statistical database and same will consider for PLR value. Cost of Equity is determined from any of the options listed above under Equity IRR. 'D' represents the debt component for the CPA and 'E' represents the equity component of the CPA. 'T' represents the tax rate applicable to the CPA. Or c. Government/official approved benchmark where such benchmarks are used for investment decisions

PART II. Generic component project activity (CPA)

Case 2: Small-Scale Grid Connected CPAs (SGC)

SECTION H. Description of generic CPA

H.1. Title of generic CPA

>>
SUNSEAP Small-scale Grid connected CPA by {entity name} [location]

H.2. Reference number of generic CPA

>>
CRX-SUNSEAP/[Country]/SGC-X,

where,
Country = Host Party
X = 1 and above.

For example, the 1st large scale CPA and if hosted in Vietnam will bear the reference number "**CRX-SUNSEAP/Vietnam/SGC-1**".

H.3. Purpose and general description of generic CPA

>>
[Insert CPA Title here] is a proposed Small-Scale Component CPA involves the installation of grid connected solar photovoltaic (Solar PV) power plant in **[insert location]**. The total installed capacity of the project activities under CPA is **[insert installed capacity (MWp)]** and is designed to contribute to the improvement of power output from renewable energy sources for **[insert Host Party regional location]** in particular and **[insert Host Party]** in general, contributing to affirm the responsibility of [Host Party] to the international community in environment protection.

CPA implementation time: From **[insert timeframe]**, detailed implementation plan is as follows:

No.	Article II. Works items	Expected completion time
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

The electricity generated by the CPA would displace equivalent amount of electricity generated by the operation of existing/ grid connected power plants (mostly fossil fuel-based power plants) and by addition of new generation sources into the grid. The CPA, thus, reduces the anthropogenic emissions of greenhouse gases (GHGs) into the atmosphere associated with the equivalent amount of electricity generation from the existing grid connected power plants (mostly fossil fuel) and by addition of new generation sources into the grid.

The CPA is expected to generate an average of **[insert calculated figure] MWh/year** which will result in the average emission reductions of **[insert calculated figure] tonnes** of CO2 every year.

In addition, the CPA will improve the socio-economic progress of each nation by generating employment opportunities as well as achieving several of the UN's Sustainable Development Goals of 2015.

According to paragraph 126, Project Standard for PoA, version 02.0, this CPA is a Type I project activity, Type I SSC project activities are "Renewable energy project activities with a maximum output capacity of 15 MW (or an appropriate equivalent)".

Contribution of CPA to Sustainable Development:

The CPA contributes to the improvement in conditions of local areas near by the surroundings of the CPA and contributes to sustainable development through below mentioned factors.

Environmental well-being:

- The CPA, by using solar energy as the renewable energy source, replaces/displaces energy generated from fossil fuels and thereby avoiding emission of greenhouse gases (GHGs) and other gases like SOx, NOx and particulate matter.
- Encourage industrial development in the region and generate economic growth.

Economic well-being:

- Implementation of solar PV technology-based CPA under the PoA will result in employment opportunities for people involved with installation of renewable energy technologies.
- The implementation of CPA will also help in reducing demand-supply gap of electricity in the country.

Social well-being:

- The solar CPA involves generation of electricity utilizing solar PV technology without emitting GHGs into atmosphere. This reduces the adverse impact of GHG emissions leading to cleaner environment.
- The CPA will create the employment opportunities for the local people during the installation of the renewable energy.
- Sales of carbon credits generated by the CPA will result in increased foreign direct investment;

Technological well-being:

- The CPA will use environment friendly, inexhaustible and clean solar energy.
- It will create opportunities for skill improvement and technology penetration in the Host Party.

Location of CPA
[insert map of project location]

[Insert location and coordinates of project activity]

H.4. Technologies/measures

>>

The project will utilize solar energy to generate no GHG emissions electricity by PV array. The CPA involves the installation of **[insert plant capacity (MWp)]** solar power project in **[insert project location]**.It is estimated that the annual average net generating electricity of the CPA is **[Insert Calculated Figure]** MWh, taking account of significant related factors as solar cell array efficiency, inverter efficiency and AC gird-connected efficiency.

Solar energy collectors and converters are solar cell modules, which directly convert solar energy into direct current through the photovoltaic effect. Thanks to the inverters, the DC is converted into

AC. A PV module consists of multiple solar modules connected, which can have capacity range from several dozen (W) to several tens of megawatts (MW). The inverter connected to each group will convert direct current (DC) into alternating current (AC). The post-converted power is supercharged to 110kV using transformers and exported to the Vietnamese national grid via load lines and electricity metering systems.
For PV modules manufactured for commercial purposes, the photovoltaic conversion efficiency of PV modules ranges from 14% to 20%.

A PV power production unit may in general constitute the following equipment:

- Solar PV array consisting of either:
  - Monocrystalline Solar Panels (Mono-SI)
  - Polycrystalline Solar Panels (p-Si)
  - Thin-Film: Amorphous Silicon Solar Panels (A-SI)
  - Concentrated PV Cell (CVP)
- Mounting structures (potentially also including tracking system)
- Junction box, distribution boxes and DC (direct current) cabling connecting modules with inverters
- Inverters
- Production meter on AC (alternating current) inverter output side (integrated to inverter)
- Data logger and/or gateway to internet (potentially integrated to inverter)
- Transformers
- Circuit breakers
- System for control and monitoring
- Grid utility meter
- Evacuation system / grid connection system

This technology is emerging as a plausible alternative in this country due to the following key factors:

- Increasingly insufficient and inadequate electricity supply to meet demand.
- Enhanced cost competitiveness of solar PV, being brought about not just through falling costs for PV equipment, but also the availability of climate finance to reduce the cost of capital.
- Shorter relative lead times associated with delivering projects compared to other capital-intensive generation technologies, including fossil fuel-based alternatives.

Need for diversification of energy supply options to reduce risks associated with reliance upon fossil fuel imports.

Electricity produced by the project activity will be monitored at the point it is exported to the grid. Equipment used in the project activity has an average lifetime of **[Insert CPA Lifetime here]** years.

The annual operation time of the proposed project is estimated to be about **[Insert total sun hours]** hours and the plant load factor (PLF) of the proposed project is **[insert PLF]** %, and an efficiency of **[insert efficiency]**%. The annual net grid-in electricity is estimated to be **[Insert calculated figure]** MWh which contributes to the reduction of GHG emission by replacing parts of the electricity supply by the **[insert Host party's energy board]**.

The baseline scenario of the proposed project is the same as the scenario prior to the start of implementation of the CPA. The electricity generated by the CPA will be transmitted to the main transformer of a newly built substation and then be connected into the grid.

The principal component of the CPA involves the Solar (PV) modules, inverters, transformers, and electricity meters; further details are included below. The technical specifications of modules and inverters used for the CPA under the CPA are given below.

The key technical parameters of the main equipment are shown as follows:

[Insert PV modules, transformer, and inverter technical specification]

SECTION I. Application of methodologies and standardized baselines

I.1. References to methodologies and standardized baselines

>>
In case of small-scale projects, i.e. CPAs with total installed capacity ≤ 15 MW:
The below methodology is used
Title: AMS-I.D.- Grid connected renewable electricity generation - Version 18.0

Tools applied in conjunction with AMS I.D for the CPA:

- Tool to calculate the emission factor for an electricity system, version 07
- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion, Version 03.0

I.2. Applicability of methodologies and standardized baselines

>>
Each Small-Scale CPA under PoA will meet the applicability conditions of the approved consolidated baseline and monitoring methodology AMS I.D Version 18.0, as described below:

Applicability Conditions	Compliance Status
This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: (a) Supplying electricity to a national or a regional grid; or (b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	**Yes** The CPA under PoA will be a Renewable Energy Project (i.e. solar photovoltaic) which falls under below applicability criteria options (a) "Supplying electricity to a national or a regional grid" and /or (b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling. Hence the CPA under PoA meets the given applicability criterion.
Illustration of respective situations under which each of the methodology (i.e. "AMS-I.D.: Grid connected renewable electricity generation", "AMS-I.F.: Renewable electricity generation for captive use and mini-grid" and "AMS-I.A.: Electricity generation by the user) applies is included below.	**Yes**

	The 1st option of Table 1[7] of AMS I.D. Version 18, 'Methodology key elements', is applicable when CPA under PoA supplies electricity to a national/regional grid and/or 3rd option is applicable when CPA under PoA supplies electricity to an identified consumer via national/regional grid through contractual arrangement.
The methodology is applicable under the following conditions: a) Install a Greenfield plant; b) Involve a capacity addition in (an) existing plant(s); c) Involve a retrofit of (an) existing plant(s); d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or e) Involve a replacement of (an) existing plant(s).	**Yes.** The proposed CPA under PoA will be an installation of a new grid connected or isolated grid connected renewable energy power plant (using solar PV technology) and hence the first condition is met.
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: a) The project activity is implemented in an existing reservoir with no change in the volume of reservoir.	**Not applicable.** This PoA does not involve Hydro Power, hence this criterion is not applicable to the CPA.

7

	Project type	AMS-I.A	AMS-I.D	AMS-I.F
1	Project supplies electricity to a national/regional grid		√	
2	Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)			√
3	Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)		√	
4	Project supplies electricity to a mini grid11 system where in the baseline all generators use exclusively fuel oil and/or diesel fuel			√
5	Project supplies electricity to household users (included in the project boundary) located in off grid areas	√		

b) The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m2 ; c) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2 .	
If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	**Not applicable** This PoA is for Solar Power, and will not involve any co-generation, hence this criterion is not applicable.
Combined heat and power (co-generation) systems are not eligible under this category.	**Not applicable** This PoA does not involve combined heat and power (co-generation) power plants/systems and hence this criterion is not applicable to the CPA.
In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	**Not applicable** The project activity involves the addition of renewable energy generation units not exceeding the limit of 15 MW to an existing renewable power generation facility.
In the case of retrofit, rehabilitation or replacement, to qualify as a small-scale project, the total output of the retrofitted, rehabilitated or replacement power plant/unit shall not exceed the limit of 15 MW	**Not applicable** The CPA under PoA will be a new grid connected renewable energy plant (Solar PV) and not a retrofit, replacement or capacity additions and therefore this criterion is not applicable to the CPA.
In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category. If the recovered methane is used for electricity generation for supply to a grid, then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as “AMS-I.C.: Thermal energy production with or without electricity” shall be explored.	**Not applicable** This PoA is for Solar Power, and will not involve the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category., hence this criterion is not applicable.
In case biomass is sourced from dedicated plantations, the applicability criteria in the tool “Project emissions from cultivation of biomass” shall apply.	**Not applicable** This PoA is for Solar Power, and will not involve the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category., hence this criterion is not applicable.

According to paragraph 126, Project Standard for PoA, version 02.0, this CPA is a Type I project activity, Type I SSC project activities are “Renewable energy project activities with a maximum output capacity of 15 MW (or an appropriate equivalent)”. This will be one of eligibility criteria for inclusion of CPA.

I.3. Application of multiple methodologies

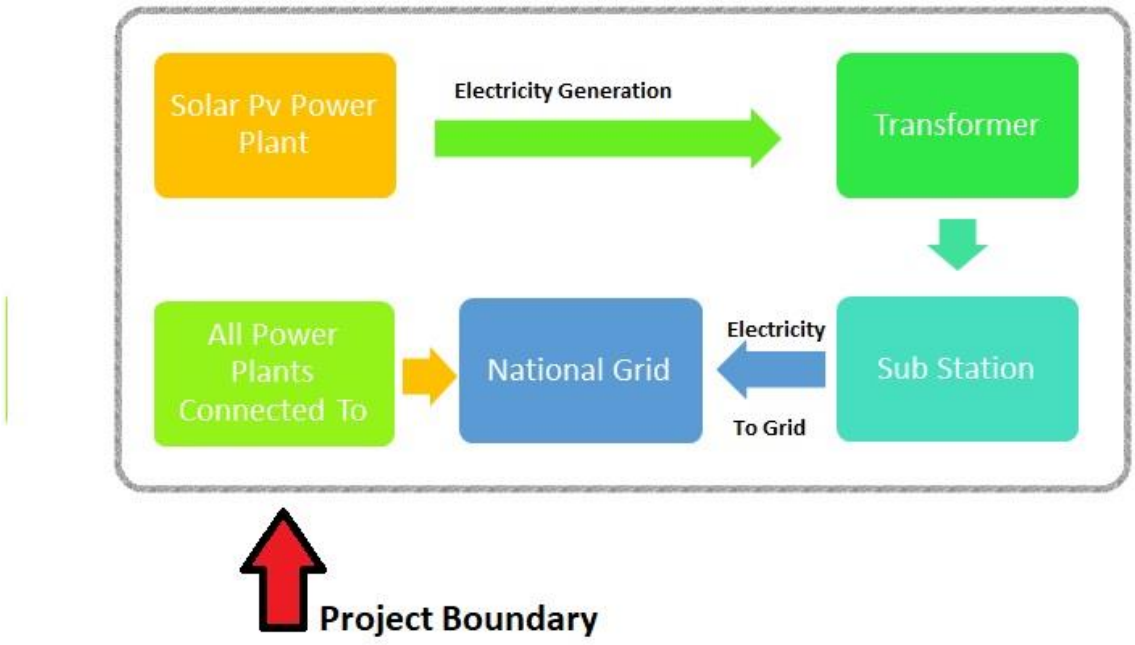
>>
AMS I.D (in its latest version at the time of PoA registration) is the only methodology applied to this CPA.

I.4. Project boundary, sources and greenhouse gases (GHGs)

>>
Project boundary has been ascertained using AMS I.D, “The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.”

Hence the project boundary includes the solar PV based power plant, sub-station(s), grid and all power plants connected to the grid. The proposed CPA will evacuate power to the grid.

The calculation of net electricity supplied to grid is under purview of Electricity Regulatory Authority of the host party, based on which the invoicing for net electricity sold will be calculated; the electricity value to be used for emission reduction calculations will be based on invoices submitted to and approved by relevant host party. Thus, for the CPA, net electricity supplied to the applicable grid in the host party is a monitoring parameter which is used for ER calculations.
The schematic representation of project boundary for grid connected CPAs is represented as below:



The greenhouse gases and emission sources included in or excluded from the project boundary are shown in table below.

Source		GHG	Included ?	Justification/Explanation
Baseline	CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the CPA.	CO_2	Yes	Major emission sources.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.

Source		GHG	Included ?	Justification/Explanation
		---	---	---
Project activity	CO2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	CPA does not involve solar thermal or geothermal power plants. Hence not applicable.
		CH_4	No	CPA does not involve solar thermal or geothermal power plants. Hence not applicable.
		N_2O	No	CPA does not involve solar thermal or geothermal power plants. Hence not applicable.
		---	---	---

I.5. Establishment and description of baseline scenario

>>

As per the approved consolidated methodology AMS I.D, Version 18, para 19:

Baseline scenario for Greenfield power plant:

The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.

The project activity would replace the weighted average of the ratio of emissions in the system represented by:

a) **Operating Margin (OM)**
The ratio of all power generating projects in the defined system over the latest three year period excluding least cost/must run projects.

b) Build Margin (BM)
The generation-weighted average emission factor of all power units *m* during the most recent years *y* for which power generation data is available.

c) **Combined Margin (CM)**
Default values established in the 'Tool to calculate the emission factor of an electricity system' for the weighting of the OM (W_{om}=75%) and for the weighting of the BM (W_{BM}=25%).[8]

Variables	Values	Source
Operating Margin Emission Factor	0.8795 tCO_2/MWh	Ministry of Natural Resources and Environment Vietnam (Most Updated Figure) [9]
Build Margin Emission Factor	0.9465 tCO_2/MWh	
Combined Margin Emission Factor	0.89625 tCO_2/MWh	Calculated as section below

During the last 25 years Vietnam's economic growth reached more than 6% each year. At the same time, the energy demand increased almost twice as fast as the GDP. With an expected continuous increase of energy demand in the next years, Vietnam's energy sector will have to face many

[8] As per Tool 7: Tool to calculate the emission factor for an electricity system Ver.7.0, Section 6.6.1 Para 86 (a)

[9] Vietnam's Grid emission factor for Vietnam, 2020, http://dcc.gov.vn/van-ban-phap-luat/1059/Nghien-cuu,-xay-dung-he-so-phat-thai-(EF)-cua-luoi-dien-Viet-Nam-(K%C3%A8m-CV-263/BDKH).html

challenges, such as limited domestic fossil resources, air pollution and climate change, causing amongst other things water scarcity. Vietnam has been ranked among the five countries, that will be most affected by climate change.

Another issue is the country's unreliable power supply, especially in rural areas. In order to face these challenges, legislative conditions have to be adopted and the framework conditions for investments have to be reformed to strengthen foreign investments and eventually stimulate the expansion of renewable energy generation capacity.

In relation to the first CPA-DD in Vietnam, Vietnam's GHG mitigation activities prior to 2020 as stated in its INDCs, 'Viet Nam's INDC identifies the GHG reduction pathway in the 2021-2030 period. With domestic resources GHG emissions will be reduced by 8% by 2030 compared to the Business as Usual scenario (BAU). The above-mentioned contribution could be increased up to 25% with international support.'.

The CPA involved setting up of renewable energy technology (solar PV) to produce electricity and supply to the grid. In the absence of the CPA, the equivalent amount of electricity would have been supplied by the country's National grid, which is fed mainly by fossil fuel fired plants.

In the absence of the CPA, the equivalent amount of electricity would have been drawn from the state grid. Hence, the baseline for the CPA is the equivalent amount of power from the respective country's National Grid.

I.6. Estimation of emission reductions

I.6.1. Explanation of methodological choices

>>

As per para 22 of AMS I.D Version 18.0, Baseline emissions include only CO2 emissions from electricity generation in power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,y}$$

Where,

BE_y	=	Baseline Emissions in year y; (tCO2 /yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM CPA in year y (MWh/yr)
$EF_{grid,y}$	=	Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO2/MWh)

As per para 26 of AMS I.D version 18.0,
If the CPA is the installation of a Greenfield power plant, then:

$$EG_{PJ,\,y} = EG_{facility,y}$$

Where:

$EG_{PJ,\,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM CPA in year y (MWh/yr)
$EG_{facility,y}$	=	Quantity of net electricity generation supplied by the project plant/unit

		to the grid in year y (MWh/yr)

As per methodology, combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (tCO2/MWh), Version 7.

The combined margin ($EF_{grid,CM,y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) and build margin (BM). Calculations for this combined margin must be based on data from an official source.

Calculation emission factors of the Vietnamese national grid $EF_{grid,CM,y}$
For solar power plants, emission factors are calculated using:

- Most updated national data: Data on Vietnamese national grid emission factors published by Vietnam DNA, Department of Climate Change, Ministry of Natural Resources and Environment with official letter No. 263/BDKH on 12 March 2020 on "Vietnam grid emission factor 2018"
- The most updated emission factor calculation tool: Version 07.0 of the "Tool to calculate emission factor for an electricity system"

Emission factor of Vietnamese national grid is calculated and published by Vietnam DNA, Department of Climate Change, Ministry of Natural Resources and Environment (Official Dispatch No. 263/BDKH dated 12 March 2020), including:

Variables	Values	Source
Operating Margin Emission Factor	0.8795 tCO_2/MWh	Ministry of Natural Resources and Environment Vietnam (Most Updated Figure) [10]
Build Margin Emission Factor	0.9465 tCO_2/MWh	

The combined margin emissions factor is calculated as follows:
$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$
In which:

- $EF_{grid,CM,y}$ = Combined margin CO2 emission factor of Vietnamese national grid in year y (tCO2/MWh)
- $EF_{grid,OM,y}$ = Operating margin CO2 emission factor of Vietnamese national grid in year y (tCO2/MWh)
- w_{OM} = Weighting of operating margin emissions factor (%)
- $EF_{grid,BM,y}$ = Build margin CO2 emission factor of Vietnamese national grid in year y (tCO2/MWh)
- w_{BM} = Weighting of build margin emissions factor (%)

However, the report of the DNA of Vietnam applying the weighting of margin emission factor and build margin emission factor is 0.5, this weighting is not applicable to solar power plants. According to version 07.0 of the "Tool to calculate the emission factor for an electricity system", the following default weights are applied to solar power plants:
$w_{OM} = 0.75$ and $w_{BM} = 0.25$

Therefore, the combined margin emissions factor for solar power plants are calculated as follows:
$EF_{grid,CM,y} = 0.75 \times 0.8795 + 0.25 \times 0.9465 = 0.89625$ (tCO2/MWh)

[10] Vietnam’s Grid emission factor for Vietnam, 2020, http://dcc.gov.vn/van-ban-phap-luat/1059/Nghien-cuu,-xay-dung-he-so-phat-thai-(EF)-cua-luoi-dien-Viet-Nam-(K%C3%A8m-CV-263/BDKH).html

The value fixed for the first crediting period will be **0.89625 tCO_2/MWh** with no need to update. This combined margin emission factor will remain fixed for first crediting period of this PoA and will be updated during second and third crediting period.

Project Emissions: For most renewable power generation projects activities PE_y =0. As per applied methodology only emission associated with the fossil fuel combustion due to release of non-condensable gases, should be accounted for the project emission.

Leakage Emissions: No Leakage emissions are considered. The main emission potentially giving rise to leakage in the context of electrical sector projects is emission arising due to activities arising such as power plant construction and upstream emission from fossil fuel use (e.g. extraction, processing, and transport). These emission sources are neglected.
Hence, LE_y= 0

Emission reduction (ERy): The CPA mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plant by renewable electricity. The emission reduction ERy by the CPA during a given year y is the difference between Baseline emission and Project emission & Leakage emission.

Thus, as per equation 9 of AMS I.D Version 18

$$ER_y = BE_y - PE_y - LE_y$$

Where,
ERy = Emission Reduction in year (tCO2e/year)
BEy = Baseline emissions in year (tCO2e/year)
PEy = Project emissions in year (tCO2e)
LEy = Leakage emissions in year y (tCO2e)

I.6.2. Data and parameters fixed ex ante

Data/Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2/MWh
Description	Operating Margin CO_2 emission factor in year y
Source of data	The most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, issued on Mar 2020.
Value(s) applied	0.8795
Choice of data or Measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0.0" as 3-year generation weighted average using data for the years. The data are obtained the most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, dated Mar 2020
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire first crediting period as stated; therefore value is provided above.

Data/Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2/MWh
Description	Build Margin CO2 emission factor in year y
Source of data	The most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, issued on Mar 2020.
Value(s) applied	0.9465

Choice of data or Measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0.0". The data are obtained the most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, dated Mar 2020
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire first crediting period as stated; therefore value is provided above.

Data/Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined Margin CO2 emission factor in year y
Source of data	The most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, issued on Mar 2020.
Value(s) applied	0.89625
Choice of data or Measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0.0". The data are obtained the most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, dated Mar 2020.
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire crediting period.

I.6.3. Modalities for ex ante calculation of emission reductions

>>

Thus, as per equation 9 of AMS I.D Version 18

$$ER_y = BE_y - PE_y - LE_y$$

Where,
ERy = Emission Reduction in year (tCO2e/year)
BEy = Baseline emissions in year (tCO2e/year)
PEy = Project emissions in year (tCO2e)
LEy = Leakage emissions in year y (tCO2e)

Baseline Emission (BE_Y)

The baseline emissions are the product of electrical energy baseline $EG_{facility,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by an emission factor.

$$BE_Y = EG_{facility,y} * EF_{grid,CM,y}$$

Where,
$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

CPA Investor's Name	Capacity	PLF (%)	Generated Power (MWh) p.a	Baseline Emission Factor (tCO2/MWh)	Baseline emissions (tCO2/ year)

$EF_{grid,CM,y}$ = Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO2/MWh).

$BE_y = EG_{BLy} \times EF_{CO2,y}$
Where

- BE_y = Baseline emissions in year y (t CO2)
- EG_{Bly} = Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year y (MWh)
- $EF_{CO2,y}$ = Emission factor (t CO2/MWh)

BE_y = xxxx * xxxx = xxxx

As per Section I.6.1:
$PE_y = 0$
$LE_y = 0$

Thus,
$ER_y = BE_y - PE_y - LE_y$
$ER_y = BE_y - 0 - 0$
$ER_y = BE_y$

Therefore,
ER_y = **xxxx**

I.7. Monitoring plan

I.7.1. Data and parameters to be monitored

Data/Parameter	**$EG_{PJ,,y}$ or $EG_{facility,y}$**
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)
Source of data	Credit Report /JMR as per Monthly Generation Report
Value(s) applied	XXX (Actual monitored Value from electricity sold invoice, specific to CPA)
Measurement methods and procedures	Data Type: Measured and Calculated Monitoring equipment: Electronic tri-vector and Bi-directional Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: One in two years Electricity exported/imported to the grid is in kWh. However, for the calculation purpose electricity exported is converted in MWh. The Bi-directional energy meter measures both export and import of CPA. The Net electricity supplied to the grid by the CPA will be calculated as a difference of electricity exported to the grid, electricity imported from the grid obtained from joint meter reading certificates/credit notes issued by the Electricity regulatory Authority of the Host Party as per below equation: $EG_{PJ,,y} = EG_{Export} - EG_{Import}$ The joint reading at metering point is carried out once in a month in presence of O&M officials and Electricity Regulatory Authority personnel. The calculations/measurement of net electricity supplied to grid is under purview of the respective country's group energy/electricity regulatory board and the CPA Owner will get value of net electricity supplied to grid and hence this parameter is mentioned as a part of monitoring plan. Cross Checking: Quantity of net electricity supplied to the grid will be cross checked from the invoices raised by the respective country's Electricity Regulatory Authority or invoices with third party.

Monitoring frequency	Monthly
QA/QC procedures	The calibration of all the meters will be undertaken at required intervals and faulty meters will be duly replaced immediately. The meters will be of accuracy class 0.2s or 0.5s. The meter accuracy class and calibration interval are under purview of the respective country's group energy/electricity regulatory board and CME/CPA owner do not have any control on it. It is also noted that apportioning procedure (if applicable for CPA) is under control of the respective country's group energy/electricity regulatory board and PP do not have any control on it. The available parameter to CME/CPA owner is the net electricity supplied to grid and same parameter is mentioned as monitoring parameter. Wherever possible, the net electricity supplied to grid can be compared with project site meters (controller meter) data.
Purpose of data	The Data/Parameter is required to calculate the baseline emission
Additional comment	Data will be archived electronically for a period of 2 years beyond the end of crediting period.

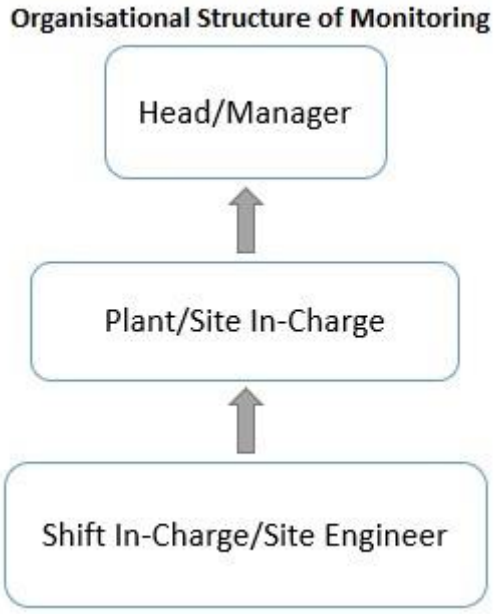
I.7.2. Sampling plan

>>
N/A

I.7.3. Other elements of monitoring plan

>>
The monitoring plan is developed in accordance with the modalities and procedures for CDM project activities and is proposed for grid-connected renewable energy power project (Solar PV) being implemented within the boundary of Vietnam. The monitoring plan, which will be implemented by the CME describes about the monitoring organisation, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage and archiving.

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data results with the CME. CME proposed the following structure for data monitoring, collection, data archiving and calibration of equipment for this CPA. The team comprises of the following members:



CME has assigned the responsibility of operation and maintenance of CPA with relevant and authorised O&M contractors. The Plant In-charge and Shift In-Charge would be deployed by O&M contractors.

Organizational Structure for monitoring:

Designation	Responsibilities
Head / Manager	• Overall functioning and maintenance of the CME • Holds complete control over monitoring aspects pertaining to the project
Plant / Site In-Charge	Maintains the data records, reliability of data (calibration of equipment) and ensures completeness of data such as: • Recording • Verification • Storage of Data
Shift In-Charge / Site Engineer	Responsible for day to day maintenance of: • Data collection • Logbook for monitored data • Storage of Data

The CPA having dedicated metering which directly measures quantity of net electricity supplied and same is considered for ER calculations. For CPA having common metering, the apportioning procedure will be followed as mentioned below to determine the parameter net electricity supplied to grid.

For CPAs which involves apportioning procedure due to common metering arrangement for solar projects:

In case of common metering arrangement, the CPA have monitoring system at project site/pooling station and at substation.

The metering is carried out at the substation via a common meter for a group of solar PV projects that is inclusive of the project activity and other than project activity.

The primary monitoring is done through a main meter which is located at the substation. Also, each project activity measures electricity at project site/pooling station.

Only the final apportioned electricity export and import for each project would be reported by national electricity board or by O&M service providers and endorsed by national electricity board in the JMRs. JMRs are taken at the substation level by the local electricity utility. Against the net electricity generation invoices are raised.

O&M service providers maintain all the individual project activity readings at projects site. After recording the Joint Meter values every month, in presence of the National Electricity Board personnel, O&M contractor apportions the generation values for each of the project activity accordingly (based on the project site/pooling station electricity data).

The apportioning of electricity export and import for each project activity is derived from project site/pooling station data. The net electricity generation from each project activity is determined as follows:

$EG_{PJ,y} = EG_{project\ site\ CPA}$ X Total $(EG_{export} – EG_{import}) / EG_{project\ site,\ total}$

Where,

$EG_{PJ.y}$ = Quantity of net electricity supplied to the grid from the CPA

Total $(EG_{export} - EG_{import})$ = Total net export value of all project activity connected to substation

$EG_{project\ site\ CPA}$ = electricity generation at project site/pooling station by CPA

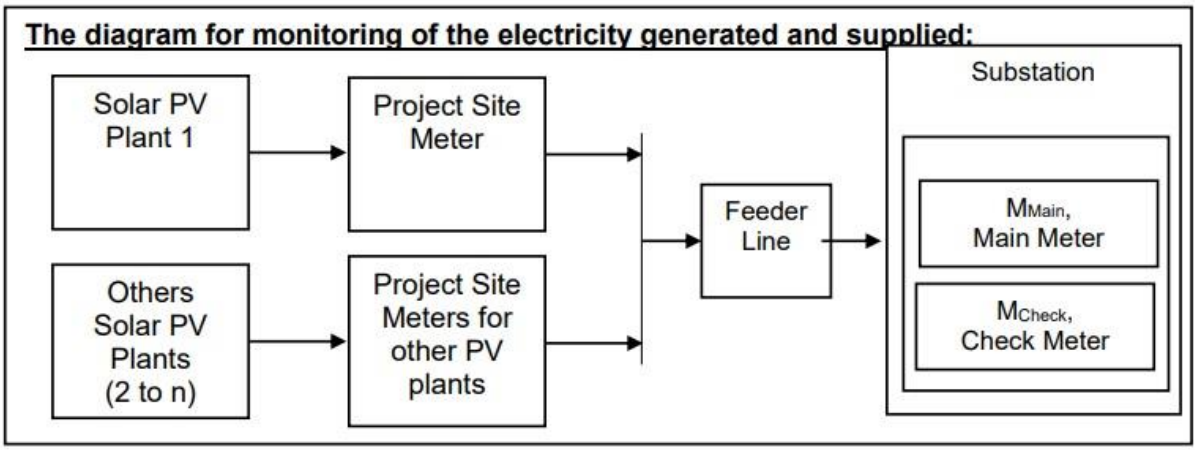
EG_{import} = Total import at sub station

EG_{export} = Total export at sub station

$EG_{project\ site,}$ total = Total electricity generation at project site/pooling station of all project activities which are connected to sub station

In general, for apportioning the common meter export/import reading at substation and ratio of respective project activity reading to all power plants (inclusive of project activity and other than project activity) reading will be used.

The schematic representation of common metering is represented as below:



In case of dedicated metering, CPA will have dedicated meters and there is no common metering involved.

The export and import of respective CPA can be determined separately by using above formula with consideration of only export or import of substation as applicable.

The above apportioning procedure (in case of common metering) will be according to Vietnam's regulations and may not be within the control of the CPA Owner or CPA Implementer. The above procedure involves two stage metering (controller/project site meter data and substation meter data). Net electricity supplied to grid will be calculated accordingly.

Since there is variation in apportioning procedure from country to country, specific CPA will mention such apportioning procedure (if applicable) based on location of CPA.

QA & QC Procedures to be followed

Necessary check meters as required would be installed, to operate in standby mode or when the main meters are not working. All meters will be calibrated at least once in two year as per CPA notification. Records of calibration certificates will be maintained for verification. Hence, high quality is ensured with the above parameters. The calibration of meters is under purview of national electricity board and CME/CPA owner do not have any control on it.

Data Recording and Storage

For measuring the net energy supplied to grid by the CPA at the interconnection point, one set of Main meter and Check Meter shall be provided. Representatives of both CME/CPA Owner and National Utility will be present to record the monthly meter readings. The National utility will prepare the credit report for the net energy supplied to the grid and same will be used as a basic document for monitoring and verification of the net energy supplied to the grid. Based on the monthly credit report, the CME/CPA Owner shall raise an invoice to the utility. Utility will pay to the CME/CPA Owner based on this document. The above document will be kept at safe storage for

verification of emission reductions generated from the project activity. The period of data storage will be 2 years beyond crediting period.

Emergency preparedness

The project activity will not result in any unidentified activity that can result in substantial emissions from the project activity. However, in case monitoring equipment get failed or found faulty, they shall be replaced with calibrated meters as quickly as possible. In case main meter get failed or found faulty, the reading of check meter will be considered.

Personnel training

In order to ensure a proper functioning of the CPA and a properly monitoring of emission reductions, the staff will be trained. The Shift In-charge and Plant In-charge will be trained in equipment operation, data recording, operation and maintenance and emergency procedures in compliance with the monitoring plant.

SECTION J. Crediting period type and duration

>>

7 years and renewable 3 times equating to 21 years or 252 months.

SECTION K. Eligibility criteria for inclusion of CPAs

>>

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion
1	Geographical boundaries of CPAs consistent with the geographical boundary of the PoA;	The geographical boundary of the CPA area is uniquely defined and within the boundary of Vietnam.	• Feasibility study report or • Third party PLF assessment report or • Land documents, or • Commissioning certificates, or • Permission from regulatory authorities or • Relevant equivalent document
2	Conditions to avoid double counting of GHG emission reductions or net anthropogenic GHG removals	The CPA must not be part of any other PoA or will not be registered as individual CPA under any other emission reduction scheme or programme, or deregistered CDM project activity	• Inclusion Contract • and cross-checked on UNFCCC website by CME • CPA implementer confirmation
3	Conditions to confirm that CPAs are neither registered as CDM project activities, included in another registered PoAs, nor the project activities that have been deregistered;	The CPA must not be part of any other PoA or will not be registered as individual CPA under any other emission reduction scheme or programme, or deregistered CDM project activity	• Inclusion contract • Cross-check on UNFCCC project cycle • CPA implementer confirmation

4	Specification of the technology/measure	Technology for solar PV array use for CPAs consisting of either: - Monocrystalline Solar Panels (Mono-SI) - Polycrystalline Solar Panels (p-Si) - Thin-Film: Amorphous Silicon Solar Panels (A-SI) - Concentrated PV Cell (CVP) The Solar PV system will include: -Mounting structures (potentially also including tracking system) -Junction box, distribution boxes and DC (direct current) cabling connecting modules with inverters -Inverters -Production meter on AC (alternating current) inverter output side (integrated to inverter) -Data logger and/or gateway to internet (potentially integrated to inverter) -Transformers -Circuit breakers -System for control and monitoring -Grid utility meter Evacuation system / grid connection system The capacity range Case: 2's entire system will be > 5MW and ≤ 15 MW. Electricity produced by the project activity will be monitored at the point it is exported to the grid. The technology shall have Approval / certification from the relevant designated authority. All the equipment of each CPA will be complying with applicable national/ international standards.	• Inclusion contract • Feasibility study report or • Offer from the party providing the equipment / construction / operation services proving that the CPA is greenfield CPA. • Power Purchase Agreement / Wheeling Agreement or the Approval from the relevant local authority or • Purchase Orders /Work Order / contract with party Providing equipment / construction /operation services. • CPA-DD

5	Conditions to check the start dates of CPAs;	The CPA only started after the start date of the PoA. The start date of the PoA is considered as **24/07/2018** which is the intimation of prior CDM consideration to UNFCCC & the relevant country's' DNAs. Therefore, start date of the CPA must be later than 24/07/2018	• Purchase orders/contracts for equipment or construction/operation services or any other documents as stated in the Glossary of CDM terms
6	Conditions to ensure compliance with the applicability of the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents;	Project Activity will compromise of only AMS I.D, where it will: 1. Be an installation of a Greenfield Plant 2. Have a plant capacity of ≤15MW 3. Only consist of Solar PV technology 4. Have all energy generated directed to the grid.	• Inclusion contract • Feasibility study report or • Offer from the party providing the equipment / construction / operation services proving that the CPA is greenfield CPA. • Power Purchase Agreement / Wheeling Agreement or the • Approval from the relevant local authority or Purchase Orders /Work Order / contract with party Providing equipment / construction /operation services. • CPA-DD
7	Condition to ensure the CPA meet the requirement for demonstration of additionality.	Small scale CPAs shall be photovoltaic project and shall be automatic additional as per positive list state in the tool 'Demonstration of additionality of small-scale project activities' version 13.0, para 11. Installed capacity to be confirmed by Inclusion Contract and documentary evidence; CME carries out further plausibility checks based on monitoring data	• Inclusion contract • Detailed Project Report prepared by third party • CPA-DD • Feasibility report
8	Conditions related to undertaking local stakeholder consultation and environmental impact analysis;	The CPA shall conduct a local stakeholder consultation and environmental impact assessment according to local regulation. This will be reviewed by CME at CPA level	• Inclusion contract • Environmental impact assessment report • Environmental impact assessment approval • Minutes of meeting of local stakeholder consultation, • attendance records, invitation letters etc.

9	Conditions to provide an affirmation that funding from Annex I Parties, if any, does not result in a diversion of official development assistance;	The CPA shall not involve funding from Annex I parties that results in a diversion of official development assistance.	• Undertaking from CPA Owner or CPA Implementer.
10	Target group (e.g. domestic/commercial/industrial, rural/urban, grid-connected/off grid), and where applicable, distribution mechanisms (e.g. direct installation);	The CPA supplies electricity to the national/regional grid or uses national grid for captive or third-party sale	• Power Purchase Agreement • Grid Evacuation approval/agreement • Wheeling Agreement, or • DPR or CPA
11	CPA remain within SSC threshold	Each CPA will have a maximum capacity of 15MW per year throughout the CPA's crediting period	• Inclusion contract • CPA-DD
12	Condition of debundling check	Small-scale CPA is not debundeled part or larger activity CPA owner confirms by Inclusion Contract that within the previous 2 years no other of his PV plants located in a distance of less than 1 km has been registered as CDM project or included as CDM CPA to a PoA	• Inclusion contract • Undertaking from CPA Owner or CPA Implementer.

PART II. Generic component project activity (CPA)

Case 3: Small-Scale Captive Consumption CPAs (SCC)

SECTION H. Description of generic CPA

H.1. Title of generic CPA

>>
SUNSEAP Small-scale Captive Consumption CPA by {entity name} [location]

H.2. Reference number of generic CPA

>>
CRX-SUNSEAP/[Country]/SCC-X,

where,
Country = Host Party
X = 1 and above.

For example, the 1st large scale CPA and if hosted in Vietnam will bear the reference number "**CRX-SUNSEAP/Vietnam/SCC-1**".

H.3. Purpose and general description of generic CPA

>>
[Insert CPA Title here] is a proposed Small-Scale Component CPA involves the installation of captive consumption solar photovoltaic (Solar PV) power plant in **[insert location]**. The total installed capacity of the project activities under CPA is **[insert installed capacity (MWp)]** and is designed to contribute to the improvement of power output from renewable energy sources for **[insert Host Party regional location]** in particular and **[insert Host Party]** in general, contributing to affirm the responsibility of [Host Party] to the international community in environment protection.

CPA implementation time: From **[insert timeframe]**, detailed implementation plan is as follows:

No.	Article III. Works items	Expected completion time
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

The electricity generated by the CPA would displace equivalent amount of electricity generated by the operation of existing/ grid connected power plants (mostly fossil fuel-based power plants) and by addition of new generation sources into the grid. The CPA, thus, reduces the anthropogenic emissions of greenhouse gases (GHGs) into the atmosphere associated with the equivalent amount of electricity generation from the existing grid connected power plants (mostly fossil fuel) and by addition of new generation sources into the grid.

The CPA is expected to generate an average of **[insert calculated figure] MWh/year** which will result in the average emission reductions of **[insert calculated figure] tonnes** of CO2 every year.

In addition, the CPA will improve the socio-economic progress of each nation by generating employment opportunities as well as achieving several of the UN's Sustainable Development Goals of 2015.

According to paragraph 126, Project Standard for PoA, version 02.0, this CPA is a Type I project activity, Type I SSC project activities are "Renewable energy project activities with a maximum output capacity of 15 MW (or an appropriate equivalent)".

Contribution of CPA to Sustainable Development:

The CPA contributes to the improvement in conditions of local areas near by the surroundings of the CPA and contributes to sustainable development through below mentioned factors.

Environmental well-being:

- The CPA, by using solar energy as the renewable energy source, replaces/displaces energy generated from fossil fuels and thereby avoiding emission of greenhouse gases (GHGs) and other gases like SOx, NOx and particulate matter.
- Encourage industrial development in the region and generate economic growth.

Economic well-being:

- Implementation of solar PV technology-based CPA under the PoA will result in employment opportunities for people involved with installation of renewable energy technologies.
- The implementation of CPA will also help in reducing demand-supply gap of electricity in the country.

Social well-being:

- The solar CPA involves generation of electricity utilizing solar PV technology without emitting GHGs into atmosphere. This reduces the adverse impact of GHG emissions leading to cleaner environment.
- The CPA will create the employment opportunities for the local people during the installation of the renewable energy.
- Sales of carbon credits generated by the CPA will result in increased foreign direct investment;

Technological well-being:

- The CPA will use environment friendly, inexhaustible and clean solar energy.
- It will create opportunities for skill improvement and technology penetration in the Host Party.

Location of CPA
[insert map of project location]

[Insert location and coordinates of project activity]

H.4. Technologies/measures

>>

The project will utilize solar energy to generate no GHG emissions electricity by PV array. The CPA involves the installation of [insert plant capacity (MWp)] solar power project in **[insert project location]**.It is estimated that the annual average net generating electricity of the CPA is **[Insert Calculated Figure]** MWh, taking account of significant related factors as solar cell array efficiency, inverter efficiency and AC gird-connected efficiency.

Solar energy collectors and converters are solar cell modules, which directly convert solar energy into direct current through the photovoltaic effect. Thanks to the inverters, the DC is converted into AC. A PV module consists of multiple solar modules connected, which can have capacity range from several dozen (W) to several tens of megawatts (MW). The inverter connected to each group will convert direct current (DC) into alternating current (AC). The post-converted power is supercharged to 110kV using transformers and exported to the Vietnamese national grid via load lines and electricity metering systems.
For PV modules manufactured for commercial purposes, the photovoltaic conversion efficiency of PV modules ranges from 14% to 20%.

A PV power production unit may in general constitute the following equipment:

- Solar PV array consisting of either:
  - Monocrystalline Solar Panels (Mono-SI)
  - Polycrystalline Solar Panels (p-Si)
  - Thin-Film: Amorphous Silicon Solar Panels (A-SI)
  - Concentrated PV Cell (CVP)
- Mounting structures (potentially also including tracking system)
- Junction box, distribution boxes and DC (direct current) cabling connecting modules with inverters
- Inverters
- Production meter on AC (alternating current) inverter output side (integrated to inverter)
- Data logger and/or gateway to internet (potentially integrated to inverter)
- Transformers
- Circuit breakers
- System for control and monitoring
- Grid utility meter
- Evacuation system / grid connection system

This technology is emerging as a plausible alternative in this country due to the following key factors:

- Increasingly insufficient and inadequate electricity supply to meet demand.
- Enhanced cost competitiveness of solar PV, being brought about not just through falling costs for PV equipment, but also the availability of climate finance to reduce the cost of capital.
- Shorter relative lead times associated with delivering projects compared to other capital-intensive generation technologies, including fossil fuel-based alternatives.

Need for diversification of energy supply options to reduce risks associated with reliance upon fossil fuel imports.

Electricity produced by the project activity will be monitored at the point it is exported to the grid. Equipment used in the project activity has an average lifetime of **[Insert CPA Lifetime here]** years.

The annual operation time of the proposed project is estimated to be about **[Insert total sun hours]** hours and the plant load factor (PLF) of the proposed project is **[insert PLF]** %, and an efficiency of **[insert efficiency]**%. The annual net grid-in electricity is estimated to be [Insert calculated figure] MWh which contributes to the reduction of GHG emission by replacing parts of the electricity supply by the [insert Host party's energy board].

The baseline scenario of the proposed project is the same as the scenario prior to the start of implementation of the CPA. The electricity generated by the CPA will be transmitted to the main transformer of a newly built substation and then be connected into the grid.

The principal component of the CPA involves the Solar (PV) modules, inverters, transformers and electricity meters; further details are included below. The technical specifications of modules and inverters used for the CPA under the CPA are given below.

The key technical parameters of the main equipment are shown as follows:

[Insert PV modules, transformer and inverter technical specification]

SECTION I. Application of methodologies and standardized baselines

I.1. References to methodologies and standardized baselines

>>
In case of small-scale projects, i.e. CPAs with total installed capacity ≤ 15 MW:
The below methodology is used
Title: AMS-I.F. - Renewable electricity generation for captive use and mini-grid --- Version 3.0

Tools applied in conjunction with AMS-I.F:

- Tool to calculate the emission factor for an electricity system, version 07
- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion, Version 03.0
- Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation, Version 03.0

I.2. Applicability of methodologies and standardized baselines

>>
Each Small-Scale CPA under PoA will meet the applicability conditions of the approved consolidated baseline and monitoring methodology AMS I.F, Version 3.0, as described below:

Applicability Conditions	Compliance Status
This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to user(s). The project activity will displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit i.e. in the absence of the project activity, the users would have been supplied electricity from one or more sources listed below: (a) A national or a regional grid (grid hereafter); (b) Fossil fuel fired captive power plant[11]; (c) A carbon intensive mini-grid.	**Yes** The CPA under PoA will be a Renewable Energy Project (i.e. solar photovoltaic) which will displace electricity from an electricity distribution system that is or would have been supplied by at least least one fossil fuel fired generating unit i.e. in the absence of the project activity, the users would have been supplied electricity from one or more sources listed below: (a) A national or a regional grid (grid hereafter); (b) Fossil fuel fired captive power plant. Users of such captive electricity will also be connected to the grid, in compliance with footnote 1 of AMS-I.F version 3.0 methodology / footnote 11 of this PDD, (c) A carbon intensive mini-grid Hence the CPA under PoA meets the given applicability criterion.
	Yes. The 2nd option of Table 1[12] of AMS I.F. Version 3, is applicable when CPA under PoA

[11] Where the users of the captive electricity are also connected to the grid in the project site.

[12]

	Project type	AMS-I.A	AMS-I.D	AMS-I.F

Illustration of respective situations under which each of the methodology (AMS-I.D., AMS-I.F. and AMS-I.A.2) applies is included in Table 3.	Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid).
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: (a) The project activity is implemented in an existing reservoir with no change in the volume of reservoir; (b) The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m2; (c) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2.	**Not applicable.** This PoA does not involve Hydro Power, hence this criterion is not applicable to the CPA.
This methodology is applicable for project activities that: (a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) Involve a capacity addition,	**Yes** Any CPA under this PoA is installation of a new grid connected renewable energy power plant (solar PV) at a site where no renewable power plant was operated prior to the implementation

1	Project supplies electricity to a national/regional grid		√	
2	Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)			√
3	Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)		√	
4	Project supplies electricity to a mini grid system where in the baseline all generators use exclusively fuel oil and/or diesel fuel			√
5	Project supplies electricity to household users (included in the project boundary) located in off grid areas	√		

(c) Involve a retrofit of (an) existing plant(s); or (d) Involve a replacement of (an) existing plant(s).	of the project activity (Greenfield plant) and hence the first criterion is applicable.
In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	**Not applicable** The CPA under the PoA will be a new captive consumption renewable energy plant (Solar PV) and not a retrofits, replacement or capacity additions and therefore this criterion is not applicable to the project activity.
In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	**Not applicable** The CPA under PoA will be Greenfield project and there is no existing power generation facility at the site. Hence the criteria is not applicable to the PoA or CPA.
If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	**Not applicable** CPA under PoA will have capacity within eligibility limit of 15 MW and will involve only renewable component (solar PV). Unit does not co-fire fossil fuels. Hence the criterion is not applicable to the CPA.
Combined heat and power (co-generation) systems are not eligible under this category.	**Not applicable** CPAs under this PoA is purely Solar PV, therefore this criterion is not applicable.
If electricity and/or steam/heat produced by the project activity is delivered to a third party, i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered that ensures that there is no double counting of emission reductions.	**Yes** If energy produced by the project activity is delivered to a third party, a contract between supplier and consumer will be entered into to ensure no double counting of emission reductions.
In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply.	**Not applicable.** The PoA is a renewable energy power project which involves solar PV and is not a biomass project. Hence the criteria is not applicable to the PoA or CPA.

According to paragraph 126, Project Standard for PoA, version 02.0, this CPA is a Type I project activity, Type I SSC project activities are "Renewable energy project activities with a maximum output capacity of 15 MW (or an appropriate equivalent)". This will be one of eligibility criteria for inclusion of CPA.

I.3. Application of multiple methodologies

>>

AMS I.F (in its latest version at the time of PoA registration) is the only methodology applied to this CPA.

I.4. Project boundary, sources and greenhouse gases (GHGs)

>>

Project boundary has been ascertained using para 17 of AMS I.F (Version 3.0, EB 81) –

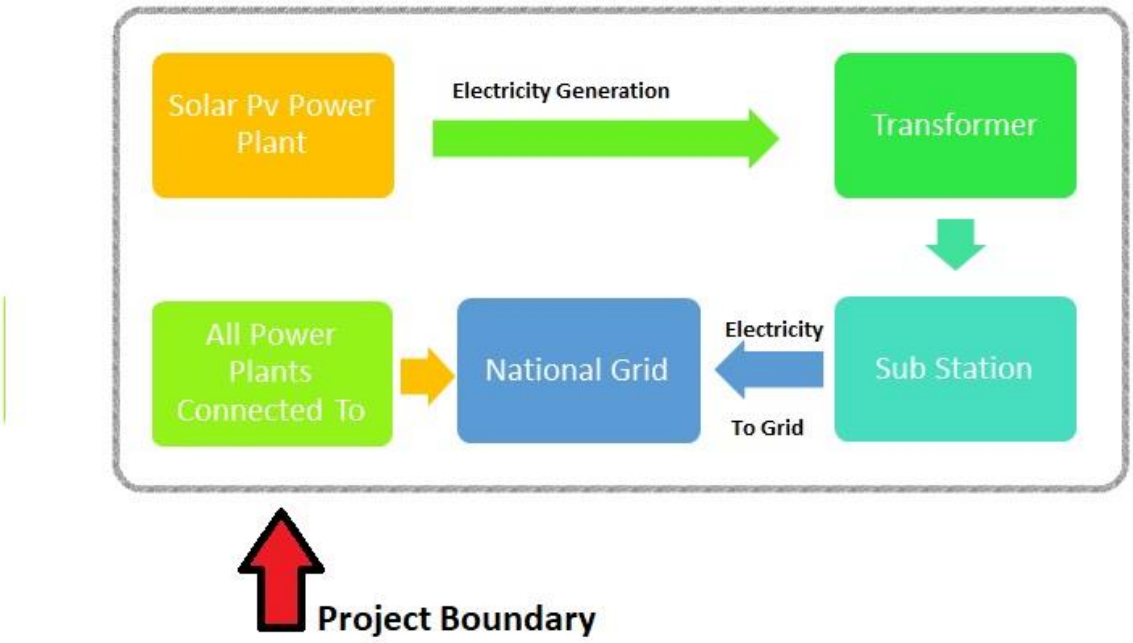
The spatial extent of the project boundary includes industrial, commercial facilities consuming energy generated by the system. In the case of electricity generated and supplied to distributed users (e.g. residential users) via mini/isolated grid(s) the project boundary may be confined to physical, geographical site of renewable generating units. The boundary also extends to the project power

plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

Hence the project boundary includes the renewable energy power plant, sub-stations, grid and all power plants connected to grid. The proposed CPA will evacuate power to the grid.

The calculation of net electricity supplied to grid is under purview of Electricity Regulatory Authority of the host party, based on which the invoicing for net electricity sold will be calculated; the electricity value to be used for emission reduction calculations will be based on invoices submitted to and approved by relevant host party. Thus, for the CPA, net electricity supplied to the applicable grid in the host party is a monitoring parameter which is used for ER calculations.

The schematic representation of project boundary for grid connected CPAs is represented as below:



Source		GHG	Included ?	Justification/Explanation
Baseline	CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the CPA.	CO_2	Yes	Major emission sources.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
		---	---	---
Project activity	CO2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	CPA does not involve solar thermal or geothermal power plants. Hence not applicable.
		CH_4	No	CPA does not involve solar thermal or geothermal power plants. Hence not applicable.
		N_2O	No	CPA does not involve solar thermal or geothermal power plants. Hence not applicable.
		---	---	---

I.5. Establishment and description of baseline scenario

>>
As per the approved consolidated methodology AMS I.F, Version 3, para 2

The CPA only applies to displace electricity from an electricity distribution system that is or would have been supplied by at least national or regional grid, fossil fuel fired captive power plant or carbon intensive mini grid.

As per para 18 of AMS I.F, Version 03, for a mini-grid system where all generators use exclusively fuel oil and/or diesel fuel, the baseline emissions is the annual electricity generated by the renewable energy unit times an emission factor for a modern diesel generating unit of the relevant capacity operating at optimal load as table 2 of AMS I.F Version 03.

Table 2. Emission factors for diesel generators systems (in kg CO2e/kWh) for three different levels of load factors.

Cases	Mini-grid with 24 hour service	(a) Mini-grid with temporary service (4-6hr/day); (b) Productive applications. (c) Water pumps	Mini-grid with storage
Load factor [%]	25%	50%	100%
< 15 kW	2.4	1.4	1.2
>=15 < 35 kW	1.9	1.3	1.1
>=35 < 135 kW	1.3	1.0	1.0
>=135 <200 kW	0.9	0.8	0.8
>200 kW	0.8	0.8	0.8

(a) A conversion factor of 3.2 kg CO2 per kg of diesel has been used (following revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories);
(b) Values derived from figures reported in RETscreen International's PV 2000 model retrieved from: http://retscreen.net/
(c) Default values

As per para 19 of AMS I.F, version 03, Baseline emissions for other systems are the product of amount electricity displaced with the electricity produced by the renewable generating unit and an emission factor.

The baseline emissions are to be calculated as follows:
$BE_y = EG_{BL,y} \text{ X } EF_{CO2,y}$

Where:
BE_y = Baseline emissions in year y (tCO2)
$EG_{BL,y}$ = Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{CO2,y}$ = Emission factor (tCO2/MWh)

Based on scenario of CPA, the below relevant option need to be selected for calculation of emission factor

1. Emission factor of a grid shall be calculated as per the procedures provided in AMS-I.D i.e by using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO2/MWh)
2. For a mini-grid system other than described in para 18 above, the baseline emission factor shall be determined as per the weighted average emissions for the current generation mix following the procedure provided in AMS-I.D
3. Emission factor for captive electricity generation shall be calculated as per the procedures described in the latest version of the "Tool to calculated baseline, project and/or leakage emissions from electricity consumption" Version 3.0

As per para 20 of methodology, for project activities that displace grid electricity and fossil fuel fired on-site captive electricity, the baseline emission factor should reflect the emissions intensity of the grid and the captive power plant in the baseline scenario i.e the weighted average emission factor for the displaced electricity is calculated using values based on the historical, prior three year ratios of electricity from captive plants and the grid. For new facilities, the most conservative (lowest) of the emission factor for the two power sources should be used.

As per option 1 above, the emission factor is calculated as combined margin emission factor as per methodology AMS-I.D version 18 which further refers "Tool to calculate the emission factor for an electricity system, version 07"

The combined margin ($EF_{CO2,y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) and build margin (BM).

a) **Operating Margin (OM)**
The ratio of all power generating projects in the defined system over the latest three year period excluding least cost/must run projects.

b) Build Margin (BM)
The generation-weighted average emission factor of all power units *m* during the most recent years *y* for which power generation data is available.

c) **Combined Margin (CM)**
Default values established in the 'Tool to calculate the emission factor of an electricity system' for the weighting of the OM (W_{om}=75%) and for the weighting of the BM (W_{BM}=25%).[13]

Variables	ValuesValues	Source
Operating Margin Emission Factor	0.8795 tCO_2/MWh	Ministry of Natural Resources and Environment Vietnam (Most Updated Figure)[14]
Build Margin Emission Factor	0.9465 tCO_2/MWh	
Combined Margin Emission Factor	0.89625 tCO_2/MWh	Calculated as section below

I.6. Estimation of emission reductions

I.6.1. Explanation of methodological choices

>>

As per para 18 of AMS I.F, Version 03, for a mini-grid system where all generators use exclusively fuel oil and/or diesel fuel, the baseline emissions is the annual electricity generated by the renewable energy unit times an emission factor for a modern diesel generating unit of the relevant capacity operating at optimal load as table 2 of AMS I.F Version 03

Table 2. Emission factors for diesel generators systems (in kg CO2e/kWh) for three different levels of load factors.

Cases	Mini-grid with 24 hour service	(a) Mini-grid with temporary service (4-6hr/day); (b) Productive applications; (c) Water pumps	Mini-grid with storage
Load factor [%]	25%	50%	100%
< 15 kW	2.4	1.4	1.2

[13] As per Tool 7 : Tool to calculate the emission factor for an electricity system Ver.7.0, Section 6.6.1 Para 86 (a)

[14] Vietnam's Grid emission factor for Vietnam, 2020, http://dcc.gov.vn/van-ban-phap-luat/1059/Nghien-cuu,-xay-dung-he-so-phat-thai-(EF)-cua-luoi-dien-Viet-Nam-(K%C3%A8m-CV-263/BDKH).html

>=15 < 35 kW	1.9	1.3	1.1
>=35 < 135 kW	1.3	1.0	1.0
>=135 <200 kW	0.9	0.8	0.8
>200 kW	0.8	0.8	0.8

(a) A conversion factor of 3.2 kg CO2 per kg of diesel has been used (following revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories);
(b) Values derived from figures reported in RETscreen International's PV 2000 model retrieved from: http://retscreen.net/
(c) Default values

As per para 19 of AMS I.F Version 3, Baseline emissions for other systems are the product of amount electricity displaced with the electricity produced by the renewable generating unit and an emission factor. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{BL,y} \times EF_{CO2,y}$$

Where,

BE_y	=	Baseline Emissions in year y; (tCO2 /yr)
$EG_{BL,y}$	=	Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{CO2,y}$	=	Emission factor (tCO2/MWh) Based on scenario of CPA, the below relevant options need to be select for calculation of emission factor 1. Emission factor of a grid shall be calculated as per the procedures provided in AMS-I.D i.e by using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO_2/MWh) 2. For a mini-grid system other than described in paragraph 18 above, the baseline emission factor shall be determined as per the weighted average emissions for the current generation mix following the procedure provided in AMS-I.D 3. Emission factor for captive electricity generation shall be calculated as per the procedures described in the latest version of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation"

As per para 20 of methodology, for project activities that displace grid electricity and fossil fuel fired on-site captive electricity, the baseline emission factor should reflect the emissions intensity of the grid and the captive power plant in the baseline scenario i.e. the weighted average emission factor for the displaced electricity is calculated using values based on the historical, prior three year ratios of electricity from captive plants and the grid. For new facilities, the most conservative (lowest) of the emission factor for the two power sources should be used.

As per option 1 above, the emission factor is calculated as combined margin emission factor as per methodology AMS I.D version 18 which further refers "Tool to calculate the emission factor for an electricity system, version 07"

The combined margin ($EF_{grid,CM,y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) and build margin (BM). Calculations for this combined margin must be based on data from an official source.

Calculation emission factors of the Vietnamese national grid $EF_{grid,CM,y}$
For solar power plants, emission factors are calculated using:

- Most updated national data: Data on Vietnamese national grid emission factors published by Vietnam DNA, Department of Climate Change, Ministry of Natural Resources and Environment with official letter No. 263/BDKH on 12 March 2020 on "Vietnam grid emission factor 2018"

- The most updated emission factor calculation tool: Version 07.0 of the "Tool to calculate emission factor for an electricity system"

Emission factor of Vietnamese national grid is calculated and published by Vietnam DNA, Department of Climate Change, Ministry of Natural Resources and Environment (Official Dispatch No. 263/BDKH dated 12 March 2020), including:

Variables	Values	Source
Operating Margin Emission Factor	0.8795 tCO_2/MWh	Ministry of Natural Resources and Environment Vietnam (Most Updated Figure) [15]
Build Margin Emission Factor	0.9465 tCO_2/MWh	

The combined margin emissions factor is calculated as follows:
$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$
In which:
$EF_{grid,CM,y}$ = Combined margin CO2 emission factor of Vietnamese national grid in year y (tCO2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO2 emission factor of Vietnamese national grid in year y (tCO2/MWh)
w_{OM} = Weighting of operating margin emissions factor (%)
$EF_{grid,BM,y}$ = Build margin CO2 emission factor of Vietnamese national grid in year y (tCO2/MWh)
w_{BM} = Weighting of build margin emissions factor (%)

However, the report of the DNA of Vietnam applying the weighting of margin emission factor and build margin emission factor is 0.5, this weighting is not applicable to solar power plants. According to version 07.0 of the "Tool to calculate the emission factor for an electricity system", the following default weights are applied to solar power plants:
w_{OM} = 0.75 and w_{BM} = 0.25

Therefore, the combined margin emissions factor for solar power plants are calculated as follows:
$EF_{grid,CM,y}$ = 0.75 x 0.8795 + 0.25 x 0.9465 = 0.89625 (tCO2/MWh)

The value fixed for the first crediting period will be **0.89625 tCO2/MWh** with no need to update. This combined margin emission factor will remain fixed for first crediting period of this PoA and will be updated during second and third crediting period.

For option 2 of emission factor In case of CPA involves a mini-grid system other than described in paragraph 18 of AMS I.F version 03 , the baseline emission factor shall be determined as per the weighted average emissions for the current generation mix following the procedure provided in AMS-I.D. The value of this parameter will be determined based on specific mini grid involved in the CPA.

For option 3 of emission factor, latest version of the methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” Version 03 is referred. As per tool, Scenario C is applicable (Case C.III), because this Option 3 of emission factor from captive electricity generation also has to include users being connected to grid electricity in the baseline scenario (as per footnote 1 of AMS-I.F version 3.0)

Scenario C: Case C.III: Electricity consumption both the grid and fossil fuel fired captive power plant(s).

[15] Vietnam’s Grid emission factor for Vietnam, 2020, http://dcc.gov.vn/van-ban-phap-luat/1059/Nghien-cuu,-xay-dung-he-so-phat-thai-(EF)-cua-luoi-dien-Viet-Nam-(K%C3%A8m-CV-263/BDKH).html

As per paragraph 31 of the tool, where this case C.III has been identified as a conservative approach, the emission factor for electricity generation should be the more conservative value between the emission factor determined as per scenario A and B respectively.

- Scenario A: Emission factor for electricity generation from grid: **0.89625 tCO2/MWh** (see option 1 procedure above)

- Scenario B: Emission factor for electricity generation from captive power plant: CPA selects Option B2 (b) as per para 28 of tool ""Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" version 3.0", where a value of **0.4 tCO_2/MWh** is chosen as the emission factor

Hence, the more conservative value chosen between Scenario A and B for this case would be **0.4 tCO_2/MWh**

Project Emissions: For most renewable power generation projects activities PE_y =0. As per applied methodology only emission associated with the fossil fuel combustion due to release of non-condensable gases, should be accounted for the project emission.

Leakage Emissions: No Leakage emissions are considered. The main emission potentially giving rise to leakage in the context of electrical sector projects is emission arising due to activities arising such as power plant construction and upstream emission from fossil fuel use (e.g. extraction, processing, and transport). These emission sources are neglected.
Hence, LE_y= 0

Emission reduction (ERy): The CPA mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plant by renewable electricity. The emission reduction ERy by the CPA during a given year y is the difference between Baseline emission and Project emission & Leakage emission.

Thus, as per equation 2 of AMS I.F Version 3

$$ER_y = BE_y - PE_y - LE_y$$

Where,
ERy = Emission Reduction in year (tCO2e/year)
BEy = Baseline emissions in year (tCO2e/year)
PEy = Project emissions in year (tCO2e)
LEy = Leakage emissions in year y (tCO2e)

I.6.2. Data and parameters fixed ex ante

Parameters for CPA involving solar photovoltaic projects where electricity displaces from national/regional grid

Data/Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2/MWh
Description	Operating Margin CO_2 emission factor in year y
Source of data	The most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, issued on Mar 2020.
Value(s) applied	0.8795
Choice of data or Measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0.0" as 3-year generation weighted average using data for the years. The data are obtained the most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, dated Mar 2020

Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire first crediting period as stated, therefore value is provided above.

Data/Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2/MWh
Description	Build Margin CO2 emission factor in year y
Source of data	The most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, issued on Mar 2020.
Value(s) applied	0.9465
Choice of data or Measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0.0". The data are obtained the most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, dated Mar 2020.
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire first crediting period as stated, therefore value is provided above.

Data/Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined Margin CO2 emission factor in year y
Source of data	The most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, issued on Mar 2020.
Value(s) applied	0.89625
Choice of data or Measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0.0". The data are obtained the most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, dated Mar 2020.
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire crediting period.

For CPAs which displaces fossil fuel fired on-site captive electricity

Data/Parameter	$EF_{diesel\ generators}$
Data unit	Kg CO_{2e}/KWh converted to tCO_2/MWh
Description	Emission factors for diesel generator systems
Source of data	Table 2 of AMS-I.F Version 03
Value(s) applied	Please refer to Table 2 of AMS-I.F Version 03
Choice of data or Measurement methods and procedures	Default values as per Table 2 of AMS I.F Version 03
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire crediting period.

For CPAs which displaces captive electricity generation

Data/Parameter	$EF_{captive}$
Data unit	tCO_2/MWh
Description	Emission factors for captive electricity generation (with grid electricity consumption, as per footnote 1 of AMS-I.F)

Source of data	Scenario C, case C.III of the tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" Version 3.0 was selected because users of captive electricity generation are also connected to the grid (as per footnote 1 of AMS-I.F ver 3.0)
Value(s) applied	0.4
Choice of data or Measurement methods and procedures	Scenario C, case C.III of the tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" version 3.0 was selected because users of captive electricity generation are also connected to the grid (as per footnote 1 of AMS-I.F ver 3.0) In this case C.III, it is stated by the tool that the more conservative emission factor between Scenario A (grid consumption, where emission factor is 0.89625 tCO2/MWh) and Scenario B Option B2(b) (captive power plant emission factor of 0.4 tCO2/MWh) must be chosen. As such, the more conservative value of 0.4 tCO2/MWh is chosen as the emission factor here for $EF_{captive}$
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire crediting period.

I.6.3. Modalities for ex ante calculation of emission reductions

>>
Thus, as per equation 9 of AMS I.F Version 3

$$\mathbf{ER_y = BE_y - PE_y - LE_y}$$

Where,
ERy = Emission Reduction in year (tCO2e/year)
BEy = Baseline emissions in year (tCO2e/year)
PEy = Project emissions in year (tCO2e)
LEy = Leakage emissions in year y (tCO2e)

Baseline Emission (BE_Y)

The baseline emissions are the product of electrical energy baseline $EG_{facility,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by an emission factor.

$$\mathbf{BE_Y = EG_{facility,y} * EF_{grid,CM,y}}$$

Where,
$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

CPA Investor's Name	Capacity	PLF (%)	Generated Power (MWh) p.a	Baseline Emission Factor (tCO2/MWh)	Baseline emissions (tCO2/ year)

$EF_{grid,CM,y}$ = Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO2/MWh).

$BE_y = EG_{BLy} \times EF_{CO2,y}$
Where

- BE_y = Baseline emissions in year y (t CO2)
- EG_{Bly} = Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year y (MWh)
- $EF_{CO2,y}$ = Emission factor (t CO2/MWh)

BE_y = xxxx * xxxx = xxxx

As per Section I.6.1:
$PE_y = 0$
$LE_y = 0$

Thus,
$ER_y = BE_y - PE_y - LE_y$
$ER_y = BE_y - 0 - 0$
$ER_y = BE_y$

Therefore,
ER_y = **xxxx**

I.7. Monitoring plan

I.7.1. Data and parameters to be monitored

I.7.1. Data/Parameter	**$EG_{BL,y}$**
Data unit	MWh
Description	Quantity of net electricity displaced in year y (MWh/yr)
Source of data	Credit Report /JMR as per Monthly Generation Report
Value(s) applied	XXX (Actual monitored Value from electricity sold invoice, specific to CPA)
Measurement methods and procedures	Data Type: Measured and Calculated Monitoring equipment: Electronic Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: One in two years The net Electricity displaced is measured in kWh. However, for the calculation purpose it is converted in MWh. Cross Checking: In the case of electricity sold to a third party, measurement results shall be cross-checked with records of sold/purchased electricity (e.g. invoices/receipts).
Monitoring frequency	Monthly

QA/QC procedures	The calibration of all the meters will be undertaken at required intervals and faulty meters will be duly replaced immediately. The meters will be of accuracy class 0.2s or 0.5s. The meter accuracy class and calibration interval are under purview of the respective country's group energy/electricity regulatory board and CME/CPA owner do not have any control on it. It is also noted that apportioning procedure (if applicable for CPA) is under control of the respective country's group energy/electricity regulatory board and PP do not have any control on it. The available parameter to CME/CPA owner is the net electricity supplied to grid and same parameter is mentioned as monitoring parameter. Wherever possible, the net electricity supplied to grid can be compared with project site meters (controller meter) data.
Purpose of data	The Data/Parameter is required to calculate the baseline emission
Additional comment	Data will be archived electronically for a period of 2 years beyond the end of crediting period.

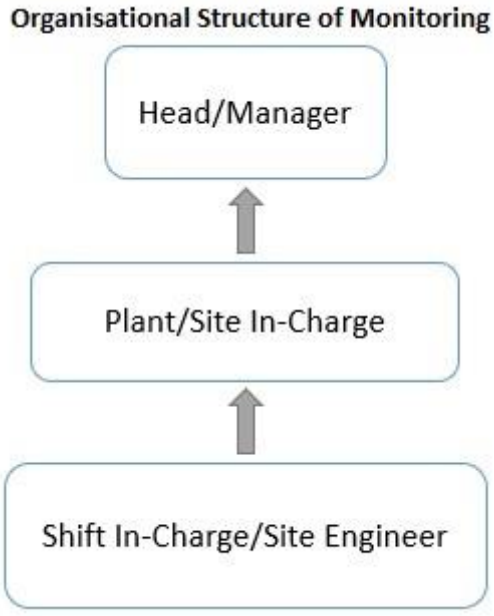
I.7.2. Sampling plan

>>
N/A

I.7.3. Other elements of monitoring plan

>>
The monitoring plan is developed in accordance with the modalities and procedures for CDM project activities and is proposed for grid-connected renewable energy power project (Solar PV) being implemented within the boundary of Vietnam. The monitoring plan, which will be implemented by the CME describes about the monitoring organisation, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage and archiving.

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data results with the CME. CME proposed the following structure for data monitoring, collection, data archiving and calibration of equipment for this CPA. The team comprises of the following members:



CME has assigned the responsibility of operation and maintenance of CPA with relevant and authorised O&M contractors. The Plant In-charge and Shift In-Charge would be deployed by O&M contractors.

Organizational Structure for monitoring:

Designation	Responsibilities
Head / Manager	• Overall functioning and maintenance of the CME • Holds complete control over monitoring aspects pertaining to the project
Plant / Site In-Charge	Maintains the data records, reliability of data (calibration of equipment) and ensures completeness of data such as: • Recording • Verification • Storage of Data
Shift In-Charge / Site Engineer	Responsible for day to day maintenance of: • Data collection • Log book for monitored data • Storage of Data

The CPA having dedicated metering which directly measures quantity of net electricity supplied and same is considered for ER calculations. For CPA having common metering, the apportioning procedure will be followed as mentioned below to determine the parameter net electricity supplied to grid.

For CPAs which involves apportioning procedure due to common metering arrangement for solar projects:

In case of common metering arrangement, the CPA have monitoring system at project site/pooling station and at substation.

The metering is carried out at the substation via a common meter for a group of solar PV projects that is inclusive of the project activity and other than project activity.

The primary monitoring is done through a main meter which is located at the substation. Also, each project activity measures electricity at project site/pooling station.

Only the final apportioned electricity export and import for each project would be reported by national electricity board or by O&M service providers and endorsed by national electricity board in the JMRs. JMRs are taken at the substation level by the local electricity utility. Against the net electricity generation invoices are raised.

O&M service providers maintain all the individual project activity readings at projects site. After recording the Joint Meter values every month, in presence of the National Electricity Board personnel, O&M contractor apportions the generation values for each of the project activity accordingly (based on the project site/pooling station electricity data).

The apportioning of electricity export and import for each project activity is derived from project site/pooling station data. The net electricity generation from each project activity is determined as follows:

$EG_{PJ,y} = EG_{project\ site\ CPA}$ X Total $(EG_{export} – EG_{import}) / EG_{project\ site,\ total}$

Where,

$EG_{PJ.y}$ = Quantity of net electricity supplied to the grid from the CPA

Total $(EG_{export} - EG_{import})$ = Total net export value of all project activity connected to substation

$EG_{project\ site\ CPA}$ = electricity generation at project site/pooling station by CPA

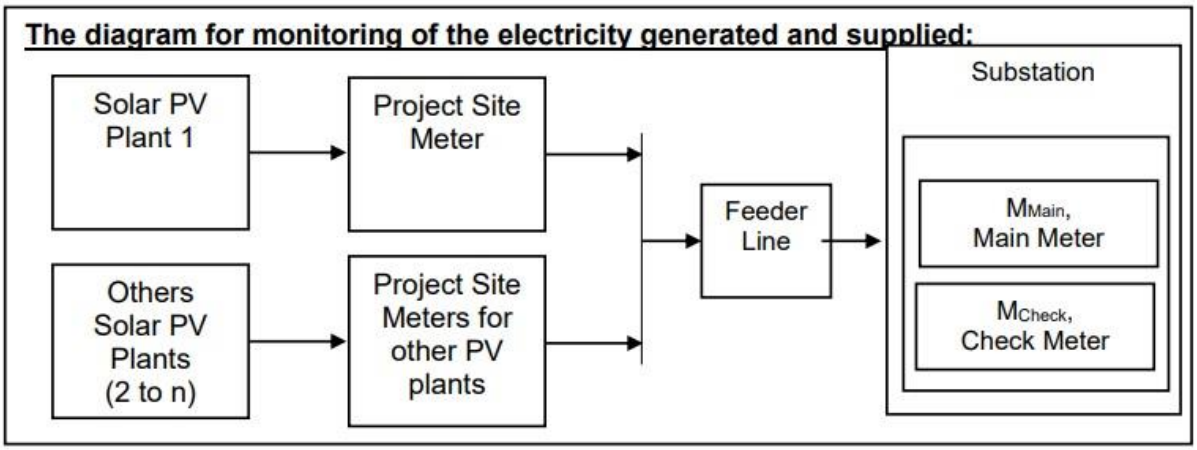
EG_{import} = Total import at sub station

EG_{export} = Total export at sub station

$EG_{project\ site,\ total}$ = Total electricity generation at project site/pooling station of all project activities which are connected to sub station

In general, for apportioning the common meter export/import reading at substation and ratio of respective project activity reading to all power plants (inclusive of project activity and other than project activity) reading will be used.

The schematic representation of common metering is represented as below:



In case of dedicated metering, CPA will have dedicated meters and there is no common metering involved.

The export and import of respective CPA can be determined separately by using above formula with consideration of only export or import of substation as applicable.

The above apportioning procedure (in case of common metering) will be according to Vietnam's regulations and may not be within the control of the CPA Owner or CPA Implementer. The above procedure involves two stage metering (controller/project site meter data and substation meter data). Net electricity supplied to grid will be calculated accordingly.

Since there is variation in apportioning procedure from country to country, specific CPA will mention such apportioning procedure (if applicable) based on location of CPA.

QA & QC Procedures to be followed

Necessary check meters as required would be installed, to operate in standby mode or when the main meters are not working. All meters will be calibrated at least once in two year as per CPA notification. Records of calibration certificates will be maintained for verification. Hence, high quality is ensured with the above parameters. The calibration of meters is under purview of national electricity board and CME/CPA owner do not have any control on it.

Data Recording and Storage

For measuring the net energy supplied to grid by the CPA at the interconnection point, one set of Main meter and Check Meter shall be provided. Representatives of both CME/CPA Owner and National Utility will be present to record the monthly meter readings. The National utility will prepare the credit report for the net energy supplied to the grid and same will be used as a basic document for monitoring and verification of the net energy supplied to the grid. Based on the monthly credit report, the CME/CPA Owner shall raise an invoice to the utility. Utility will pay to the CME/CPA Owner based on this document. The above document will be kept at safe storage for

verification of emission reductions generated from the project activity. The period of data storage will be 2 years beyond crediting period.

Emergency preparedness

The project activity will not result in any unidentified activity that can result in substantial emissions from the project activity. However, in case monitoring equipment get failed or found faulty, they shall be replaced with calibrated meters as quickly as possible. In case main meter get failed or found faulty, the reading of check meter will be considered.

Personnel training

In order to ensure a proper functioning of the CPA and a properly monitoring of emission reductions, the staff will be trained. The Shift In-charge and Plant In-charge will be trained in equipment operation, data recording, operation and maintenance and emergency procedures in compliance with the monitoring plant.

SECTION J. Crediting period type and duration

>>

7 years and renewable 3 times equating to 21 years or 252 months.

SECTION K. Eligibility criteria for inclusion of CPAs

>>

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion
1	Geographical boundaries of CPAs consistent with the geographical boundary of the PoA;	The geographical boundary of the CPA area is uniquely defined and within the boundary of Vietnam.	• Feasibility study report or • Third party PLF assessment report or • Land documents, or • Commissioning certificates, or • Permission from regulatory authorities or • Relevant equivalent document
2	Conditions to avoid double counting of GHG emission reductions or net anthropogenic GHG removals	The CPA must not be part of any other PoA or will not be registered as individual CPA under any other emission reduction scheme or programme, or deregistered CDM project activity	• Inclusion Contract • and cross-checked on UNFCCC website by CME • CPA implementer confirmation
3	Conditions to confirm that CPAs are neither registered as CDM project activities, included in another registered PoAs, nor the project activities that have been deregistered;	The CPA must not be part of any other PoA or will not be registered as individual CPA under any other emission reduction scheme or programme, or deregistered CDM project activity	• Inclusion contract • Cross-check on UNFCCC project cycle • CPA implementer confirmation

4	Specification of the technology/measure	Technology for solar PV array use for CPAs consisting of either: - Monocrystalline Solar Panels (Mono-SI) - Polycrystalline Solar Panels (p-Si) - Thin-Film: Amorphous Silicon Solar Panels (A-SI) - Concentrated PV Cell (CVP) The Solar PV system will include: -Mounting structures (potentially also including tracking system) -Junction box, distribution boxes and DC (direct current) cabling connecting modules with inverters -Inverters -Production meter on AC (alternating current) inverter output side (integrated to inverter) -Data logger and/or gateway to internet (potentially integrated to inverter) -Transformers -Circuit breakers -System for control and monitoring -Grid utility meter Evacuation system / grid connection system The capacity range of Case 3's entire system will be > 5MW and ≤ 15 MW. Electricity produced by the project activity will be monitored at the point it is exported to the grid. The technology shall have Approval / certification from the relevant designated authority. All the equipment of each CPA will be complying with applicable national/ international standards.	• Inclusion contract • Feasibility study report or • Offer from the party providing the equipment / construction / operation services proving that the CPA is greenfield CPA. • Power Purchase Agreement / Wheeling Agreement or the Approval from the relevant local authority or • Purchase Orders /Work Order / contract with party Providing equipment / construction /operation services. • CPA-DD

5	Conditions to check the start dates of CPAs;	The CPA only started after the start date of the PoA. The start date of the PoA is considered as **24/07/2018** which is the intimation of prior CDM consideration to UNFCCC & the relevant country's' DNAs. Therefore, start date of the CPA must be later than 24/07/2018	• Purchase orders/contracts for equipment or construction/operation services or any other documents as stated in the Glossary of CDM terms
6	Conditions to ensure compliance with the applicability of the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents;	Project Activity will compromise of only AMS I.F, where it will: 1. Be an installation of a Greenfield Plant 2. Have a plant capacity of ≤15MW 3. Only consist of Solar PV technology 4. Users would have been supplied electricity from one or more sources listed below: (a) A national or a regional grid (grid hereafter); (b) Fossil fuel fired captive power plant. Users of such captive electricity will also be connected to the grid in the project site, as per footnote 1 of AMS-I.F ver 3.0 (c) A carbon intensive mini-grid. 5. At least one fossil-fuel fired generation source 6. Project classified as "generator" 7. PV generation monitored by grid meter, and data transmitted to CME	• Inclusion contract • Feasibility study report or • Offer from the party providing the equipment / construction / operation services proving that the CPA is greenfield CPA. • The source of electricity to the user can be verified through Power Purchase Agreement / Wheeling Agreement or • Approval from the relevant local authority or Purchase Orders /Work Order / contract with party providing equipment / construction /operation services. • CPA-DD will be provided. CPA-DD will be checked/used for identification of relevant baseline scenario as per the methodology and ensure that users should not be supplied with renewable electricity in the baseline scenario.
7	Condition to ensure the CPA meet the requirement for demonstration of additionality.	Small scale CPAs shall be photovoltaic project and shall be automatic additional as per positive list state in the tool 'Demonstration of additionality of small-scale project activities' version 13.0, para 11. Installed capacity to be confirmed by Inclusion Contract and documentary evidence; CME carries out further plausibility checks based on monitoring data	• Inclusion contract • Detailed Project Report prepared by third party • CPA-DD • Feasibility report

8	Conditions related to undertaking local stakeholder consultation and environmental impact analysis;	The CPA shall conduct a local stakeholder consultation and environmental impact assessment according to local regulation. This will be reviewed by CME at CPA level	• Inclusion contract • Environmental impact assessment report • Environmental impact assessment approval • Minutes of meeting of local stakeholder consultation, • attendance records, invitation letters etc.
9	Conditions to provide an affirmation that funding from Annex I Parties, if any, does not result in a diversion of official development assistance;	The CPA shall not involve funding from Annex I parties that results in a diversion of official development assistance.	• Undertaking from CPA Owner or CPA Implementer.
10	Target group (e.g. domestic/commercial/industrial, rural/urban, grid-connected/off grid), and where applicable, distribution mechanisms (e.g. direct installation);	The CPA supplies electricity to the national/regional grid or uses national grid for captive or third-party sale	• Power Purchase Agreement • Grid Evacuation approval/agreement • Wheeling Agreement, or • DPR or CPA
11	CPA remain within SSC threshold	Each CPA will have a maximum capacity of 15MW per year throughout the CPA's crediting period	• Inclusion contract • CPA-DD
12	Condition of debundling check	Small-scale CPA is not debundeled part or larger activity CPA owner confirms by Inclusion Contract that within the previous 2 years no other of his PV plants located in a distance of less than 1 km has been registered as CDM project or included as CDM CPA to a PoA	• Inclusion contract • Undertaking from CPA Owner or CPA Implementer.

PART II. Generic component project activity (CPA)

Case 4: Micro-Scale Grid Connected CPAs (MGC)

SECTION H. Description of generic CPA

H.1. Title of generic CPA

>>
SUNSEAP Micro-scale Grid connected CPA by {entity name} [location]

H.2. Reference number of generic CPA

>>
CRX-SUNSEAP/[Country]/MGC-X,

Where,
Country = Host Party
X = 1 and above.

For example, the 1st large scale CPA and if hosted in Vietnam will bear the reference number "**CRX-SUNSEAP/Vietnam/MGC-1**".

H.3. Purpose and general description of generic CPA

>>
[Insert CPA Title here] is a proposed Micro-Scale Component CPA involves the installation of grid connected solar photovoltaic (Solar PV) power plant in **[insert location]**. The total installed capacity of the project activities under CPA is **[insert installed capacity (MWp)]** and is designed to contribute to the improvement of power output from renewable energy sources for **[insert Host Party regional location]** in particular and **[insert Host Party]** in general, contributing to affirm the responsibility of [Host Party] to the international community in environment protection.

CPA implementation time: From **[insert timeframe]**, detailed implementation plan is as follows:

No.	Article IV. Works items	Expected completion time
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

The electricity generated by the CPA would displace equivalent amount of electricity generated by the operation of existing/ grid connected power plants (mostly fossil fuel-based power plants) and by addition of new generation sources into the grid. The CPA, thus, reduces the anthropogenic emissions of greenhouse gases (GHGs) into the atmosphere associated with the equivalent amount of electricity generation from the existing grid connected power plants (mostly fossil fuel) and by addition of new generation sources into the grid.

The CPA is expected to generate an average of **[insert calculated figure] MWh/year** which will result in the average emission reductions of **[insert calculated figure] tonnes** of CO2 every year.

In addition, the CPA will improve the socio-economic progress of each nation by generating employment opportunities as well as achieving several of the UN's Sustainable Development Goals of 2015.

According to paragraph 128, Project Standard for PoA, version 02.0, this CPA is a Type I project activity, Type I Micro scale project activities are "Renewable energy project activities with a maximum output capacity of 5 MW (or an appropriate equivalent)".

Contribution of CPA to Sustainable Development:

The CPA contributes to the improvement in conditions of local areas near by the surroundings of the CPA and contributes to sustainable development through below mentioned factors.

Environmental well-being:

- The CPA, by using solar energy as the renewable energy source, replaces/displaces energy generated from fossil fuels and thereby avoiding emission of greenhouse gases (GHGs) and other gases like SOx, NOx and particulate matter.
- Encourage industrial development in the region and generate economic growth.

Economic well-being:

- Implementation of solar PV technology-based CPA under the PoA will result in employment opportunities for people involved with installation of renewable energy technologies.
- The implementation of CPA will also help in reducing demand-supply gap of electricity in the country.

Social well-being:

- The solar CPA involves generation of electricity utilizing solar PV technology without emitting GHGs into atmosphere. This reduces the adverse impact of GHG emissions leading to cleaner environment.
- The CPA will create the employment opportunities for the local people during the installation of the renewable energy.
- Sales of carbon credits generated by the CPA will result in increased foreign direct investment;

Technological well-being:

- The CPA will use environment friendly, inexhaustible and clean solar energy.
- It will create opportunities for skill improvement and technology penetration in the Host Party.

Location of CPA
[insert map of project location]

[Insert location and coordinates of project activity]

H.4. Technologies/measures

>>

The project will utilize solar energy to generate no GHG emissions electricity by PV array. The CPA involves the installation of **[insert plant capacity (MWp)]** solar power project in **[insert project location]**.It is estimated that the annual average net generating electricity of the CPA is **[Insert Calculated Figure]** MWh, taking account of significant related factors as solar cell array efficiency, inverter efficiency and AC gird-connected efficiency.

Solar energy collectors and converters are solar cell modules, which directly convert solar energy into direct current through the photovoltaic effect. Thanks to the inverters, the DC is converted into

AC. A PV module consists of multiple solar modules connected, which can have capacity range from several dozen (W) to several tens of megawatts (MW). The inverter connected to each group will convert direct current (DC) into alternating current (AC). The post-converted power is supercharged to 110kV using transformers and exported to the Vietnamese national grid via load lines and electricity metering systems.
For PV modules manufactured for commercial purposes, the photovoltaic conversion efficiency of PV modules ranges from 14% to 20%.

A PV power production unit may in general constitute the following equipment:

- Solar PV array consisting of either:
  - Monocrystalline Solar Panels (Mono-SI)
  - Polycrystalline Solar Panels (p-Si)
  - Thin-Film: Amorphous Silicon Solar Panels (A-SI)
  - Concentrated PV Cell (CVP)
- Mounting structures (potentially also including tracking system)
- Junction box, distribution boxes and DC (direct current) cabling connecting modules with inverters
- Inverters
- Production meter on AC (alternating current) inverter output side (integrated to inverter)
- Data logger and/or gateway to internet (potentially integrated to inverter)
- Transformers
- Circuit breakers
- System for control and monitoring
- Grid utility meter
- Evacuation system / grid connection system

This technology is emerging as a plausible alternative in this country due to the following key factors:

- Increasingly insufficient and inadequate electricity supply to meet demand.
- Enhanced cost competitiveness of solar PV, being brought about not just through falling costs for PV equipment, but also the availability of climate finance to reduce the cost of capital.
- Shorter relative lead times associated with delivering projects compared to other capital-intensive generation technologies, including fossil fuel-based alternatives.

Need for diversification of energy supply options to reduce risks associated with reliance upon fossil fuel imports.

Electricity produced by the project activity will be monitored at the point it is exported to the grid. Equipment used in the project activity has an average lifetime of **[Insert CPA Lifetime here]** years.

The annual operation time of the proposed project is estimated to be about **[Insert total sun hours]** hours and the plant load factor (PLF) of the proposed project is **[insert PLF]** %, and an efficiency of **[insert efficiency]**%. The annual net grid-in electricity is estimated to be **[Insert calculated figure]** MWh which contributes to the reduction of GHG emission by replacing parts of the electricity supply by the **[insert Host party's energy board]**.

The baseline scenario of the proposed project is the same as the scenario prior to the start of implementation of the CPA. The electricity generated by the CPA will be transmitted to the main transformer of a newly built substation and then be connected into the grid.

The principal component of the CPA involves the Solar (PV) modules, inverters, transformers and electricity meters; further details are included below. The technical specifications of modules and inverters used for the CPA under the CPA are given below.

The key technical parameters of the main equipment are shown as follows:

[Insert PV modules, transformer and inverter technical specification]

SECTION I. Application of methodologies and standardized baselines

I.1. References to methodologies and standardized baselines

>>
In case of micro-scale projects, i.e. CPAs with total installed capacity ≤ 5 MW:
The below methodology is used
Title: AMS-I.D.- Grid connected renewable electricity generation --- Version 18.0
Tools applied in conjunction with AMS-I.D:

- Tool to calculate the emission factor for an electricity system, version 07
- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion, Version 03.0

I.2. Applicability of methodologies and standardized baselines

>>
Each Micro-Scale CPA under PoA will meet the applicability conditions of the approved consolidated baseline and monitoring methodology AMS I.D Version 18.0, as described below:

Applicability Conditions	Compliance Status
This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: (a) Supplying electricity to a national or a regional grid; or (b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	**Yes** The CPA under PoA will be a Renewable Energy Project (i.e. solar photovoltaic) which falls under below applicability criteria options (a) "Supplying electricity to a national or a regional grid" and /or (b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling. Hence the CPA under PoA meets the given applicability criterion.
Illustration of respective situations under which each of the methodology (i.e. "AMS-I.D.: Grid connected renewable electricity generation",	**Yes** The 1st option of Table 1[16] of AMS I.D. Version 18, 'Methodology key elements', is applicable

16

	Project type	AMS-I.A	AMS-I.D	AMS-I.F
1	Project supplies electricity to a national/regional grid		√	
2	Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)			√
3	Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)		√	

"AMS-I.F.: Renewable electricity generation for captive use and mini-grid" and "AMS-I.A.: Electricity generation by the user) applies is included below.	when CPA under PoA supplies electricity to a national/regional grid and/or 3rd option is applicable when CPA under PoA supplies electricity to an identified consumer via national/regional grid through contractual arrangement.
The methodology is applicable under the following conditions: f) Install a Greenfield plant; g) Involve a capacity addition in (an) existing plant(s); h) Involve a retrofit of (an) existing plant(s); i) Involve a rehabilitation of (an) existing plant(s)/unit(s); or j) Involve a replacement of (an) existing plant(s).	**Yes.** The proposed CPA under PoA will be an installation of a new grid connected or isolated grid connected renewable energy power plant (using solar PV technology) and hence the first condition is met.
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: d) The project activity is implemented in an existing reservoir with no change in the volume of reservoir. e) The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m2 ; f) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2 .	**Not applicable.** This PoA does not involve Hydro Power, hence this criterion is not applicable to the CPA.
If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	**Not applicable** This PoA is for Solar Power, and will not involve any co-generation, hence this criterion is not applicable.
Combined heat and power (co-generation) systems are not eligible under this category.	**Not applicable**

4	Project supplies electricity to a mini grid11 system where in the baseline all generators use exclusively fuel oil and/or diesel fuel			√
5	Project supplies electricity to household users (included in the project boundary) located in off grid areas	√		

	This PoA does not involve combined heat and power (co-generation) power plants/systems and hence this criterion is not applicable to the CPA.
In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	**Not applicable** The project activity involves the addition of renewable energy generation units not exceeding the limit of 5 MW to an existing renewable power generation facility.
In the case of retrofit, rehabilitation or replacement, to qualify as a small-scale project, the total output of the retrofitted, rehabilitated or replacement power plant/unit shall not exceed the limit of 15 MW	**Not applicable** The CPA under PoA will be a new grid connected renewable energy plant (Solar PV) and not a retrofit, replacement or capacity additions and therefore this criterion is not applicable to the CPA.
In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category. If the recovered methane is used for electricity generation for supply to a grid, then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as "AMS-I.C.: Thermal energy production with or without electricity" shall be explored.	**Not applicable** This PoA is for Solar Power, and will not involve the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category., hence this criterion is not applicable.
In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply.	**Not applicable** This PoA is for Solar Power, and will not involve the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category., hence this criterion is not applicable.

According to paragraph 128, Project Standard for PoA, version 02.0, this CPA is a Type I project activity, Type I Micro scale project activities are "Renewable energy project activities with a maximum output capacity of 5 MW (or an appropriate equivalent)". This will be one of eligibility criteria for inclusion of CPA.

I.3. Application of multiple methodologies

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ASM I.D (in its latest version at the time of PoA registration) is the only methodology applied to this CPA.

I.4. Project boundary, sources and greenhouse gases (GHGs)

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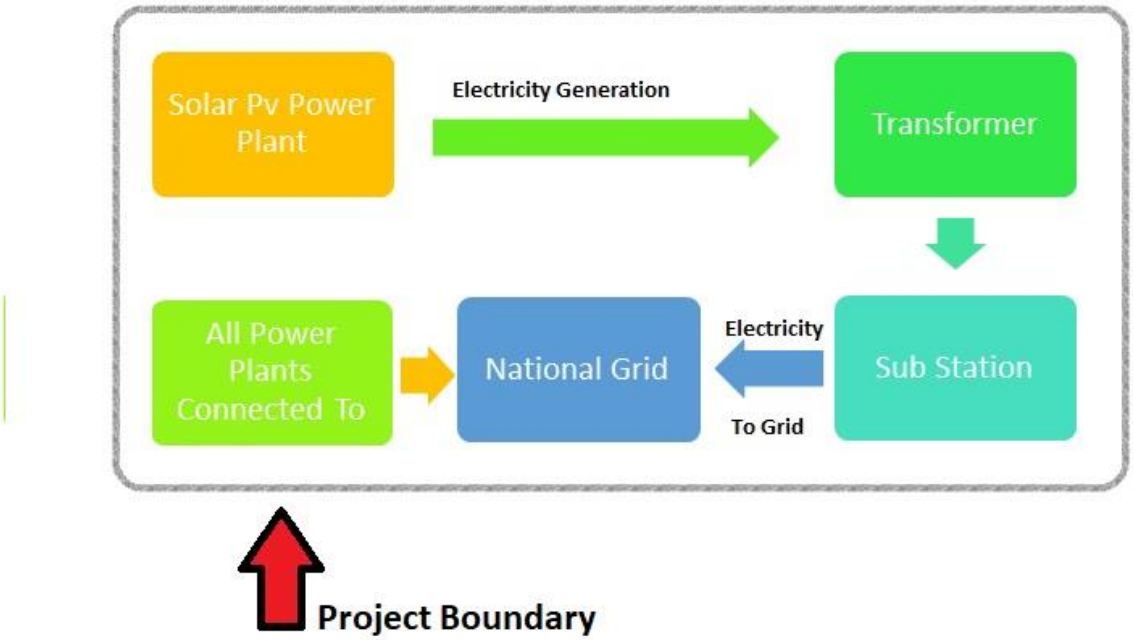
Project boundary has been ascertained using AMS I.D, "The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to."

Hence the project boundary includes the renewable energy power plant, sub-stations, grid and all power plants connected to isolated grid. The proposed CPA will evacuate power to the isolated grid. The calculation of net electricity supplied to grid is under purview of Electricity Regulatory Authority of the host party, based on which the invoicing for net electricity sold will be calculated; the electricity

value to be used for emission reduction calculations will be based on invoices submitted to and approved by relevant host party. Thus, for the CPA, net electricity supplied to the applicable grid in the host party is a monitoring parameter which is used for ER calculations.

The calculation of net electricity supplied to grid is under purview of state electricity board and CPA Owner or CPA Implementer does not have any control on it. Thus, for CPA, net electricity supplied to grid is the monitoring parameter which is used for ER calculations.

The schematic representation of project boundary for grid connected CPAs is represented as below:



The greenhouse gases and emission sources included in or excluded from the project boundary are shown in table below.

Source		GHG	Included ?	Justification/Explanation
Baseline	CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the CPA.	CO_2	Yes	Major emission sources.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
		---	---	---
Project activity	CO2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	CPA does not involve solar thermal or geothermal power plants. Hence not applicable.
		CH_4	No	CPA does not involve solar thermal or geothermal power plants. Hence not applicable.
		N_2O	No	CPA does not involve solar thermal or geothermal power plants. Hence not applicable.
		---	---	---

I.5. Establishment and description of baseline scenario

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As per the approved consolidated methodology AMS I.D, Version 18, para 19:

Baseline scenario for Greenfield power plant:

The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.

The project activity would replace the weighted average of the ratio of emissions in the system represented by:

a) **Operating Margin (OM)**
The ratio of all power generating projects in the defined system over the latest three-year period excluding least cost/must run projects.

b) Build Margin (BM)
The generation-weighted average emission factor of all power units *m* during the most recent years *y* for which power generation data is available.

c) **Combined Margin (CM)**
Default values established in the 'Tool to calculate the emission factor of an electricity system' for the weighting of the OM (W_{om}=75%) and for the weighting of the BM (W_{BM}=25%).[17]

Variables	Values	Source
Operating Margin Emission Factor	0.8795 tCO_2/MWh	Ministry of Natural Resources and Environment Vietnam (Most Updated Figure) [18]
Build Margin Emission Factor	0.9465 tCO_2/MWh	
Combined Margin Emission Factor	0.89625 tCO_2/MWh	Calculated as section below

During the last 25 years Vietnam's economic growth reached more than 6% each year. At the same time, the energy demand increased almost twice as fast as the GDP. With an expected continuous increase of energy demand in the next years, Vietnam's energy sector will have to face many challenges, such as limited domestic fossil resources, air pollution and climate change, causing amongst other things water scarcity. Vietnam has been ranked among the five countries, that will be most affected by climate change.

Another issue is the country's unreliable power supply, especially in rural areas. In order to face these challenges, legislative conditions have to be adopted and the framework conditions for investments have to be reformed to strengthen foreign investments and eventually stimulate the expansion of renewable energy generation capacity.

In relation to the first CPA-DD in Vietnam, Vietnam's GHG mitigation activities prior to 2020 as stated in its INDCs, 'Viet Nam's INDC identifies the GHG reduction pathway in the 2021-2030 period. With domestic resources GHG emissions will be reduced by 8% by 2030 compared to the Business as Usual scenario (BAU). The above-mentioned contribution could be increased up to 25% with international support.'.

[17] As per Tool 7 : Tool to calculate the emission factor for an electricity system Ver.7.0, Section 6.6.1 Para 86 (a)

[18] Grid emission factor for Vietnam, 2020, http://dcc.gov.vn/van-ban-phap-luat/1059/Nghien-cuu,-xay-dung-he-so-phat-thai-(EF)-cua-luoi-dien-Viet-Nam-(K%C3%A8m-CV-263/BDKH).html

The CPA involved setting up of renewable energy technology (solar PV) to produce electricity and supply to the grid. In the absence of the CPA, the equivalent amount of electricity would have been supplied by the country's National grid, which is fed mainly by fossil fuel fired plants.

In the absence of the CPA, the equivalent amount of electricity would have been drawn from the state grid. Hence, the baseline for the CPA is the equivalent amount of power from the respective country's National Grid.

I.6. Estimation of emission reductions

I.6.1. Explanation of methodological choices

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As per para 22 of AMS I.D Version 18.0, Baseline emissions include only CO2 emissions from electricity generation in power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,y}$$

Where,

BE_y	=	Baseline Emissions in year y; (tCO2 /yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM CPA in year y (MWh/yr)
$EF_{grid,y}$	=	Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO2/MWh)

As per para 26 of AMS I.D version 18.0,
If the CPA is the installation of a Greenfield power plant, then:

$$EG_{PJ,\,y} = EG_{facility,y}$$

Where:

$EG_{PJ,\,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM CPA in year y (MWh/yr)
$EG_{facility,y}$	=	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

As per methodology, combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO2/MWh), Version 7.

The combined margin ($EF_{grid,CM,y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) and build margin (BM). Calculations for this combined margin must be based on data from an official source.

Calculation emission factors of the Vietnamese national grid $EF_{grid,CM,y}$
For solar power plants, emission factors are calculated using:

- Most updated national data: Data on Vietnamese national grid emission factors published by Vietnam DNA, Department of Climate Change, Ministry of Natural Resources and Environment with official letter No. 263/BDKH on 12 March 2020 on "Vietnam grid emission factor 2018"
- The most updated emission factor calculation tool: Version 07.0 of the "Tool to calculate emission factor for an electricity system"

Emission factor of Vietnamese national grid is calculated and published by Vietnam DNA, Department of Climate Change, Ministry of Natural Resources and Environment (Official Dispatch No. 263/BDKH dated 12 March 2020), including:

Variables	Values	Source
Operating Margin Emission Factor	0.8795 tCO_2/MWh	Ministry of Natural Resources and Environment Vietnam (Most Updated Figure) [19]
Build Margin Emission Factor	0.9465 tCO_2/MWh	

The combined margin emissions factor is calculated as follows:
$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$
In which:

- $EF_{grid,CM,y}$ = Combined margin CO2 emission factor of Vietnamese national grid in year y (tCO2/MWh)
- $EF_{grid,OM,y}$ = Operating margin CO2 emission factor of Vietnamese national grid in year y (tCO2/MWh)
- w_{OM} = Weighting of operating margin emissions factor (%)
- $EF_{grid,BM,y}$ = Build margin CO2 emission factor of Vietnamese national grid in year y (tCO2/MWh)
- w_{BM} = Weighting of build margin emissions factor (%)

However, the report of the DNA of Vietnam applying the weighting of margin emission factor and build margin emission factor is 0.5, this weighting is not applicable to solar power plants. According to version 07.0 of the "Tool to calculate the emission factor for an electricity system", the following default weights are applied to solar power plants:
w_{OM} = 0.75 and w_{BM} = 0.25

Therefore, the combined margin emissions factor for solar power plants are calculated as follows:
$EF_{grid,CM,y}$ = 0.75 x 0.8795 + 0.25 x 0.9465 = 0.89625 (tCO2/MWh)

The value fixed for the first crediting period will be **0.89625 tCO_2/MWh** with no need to update. This combined margin emission factor will remain fixed for first crediting period of this PoA and will be updated during second and third crediting period.

Project Emissions: For most renewable power generation projects activities PE_y =0. As per applied methodology only emission associated with the fossil fuel combustion due to release of non-condensable gases, should be accounted for the project emission.
Leakage Emissions: No Leakage emissions are considered. The main emission potentially giving rise to leakage in the context of electrical sector projects is emission arising due to activities arising such as power plant construction and upstream emission from fossil fuel use (e.g. extraction, processing, and transport). These emission sources are neglected.
Hence, LE_y= 0

[19] Vietnam's Grid emission factor for Vietnam, 2020, http://dcc.gov.vn/van-ban-phap-luat/1059/Nghien-cuu,-xay-dung-he-so-phat-thai-(EF)-cua-luoi-dien-Viet-Nam-(K%C3%A8m-CV-263/BDKH).html

Emission reduction (ERy): The CPA mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plant by renewable electricity. The emission reduction ERy by the CPA during a given year y is the difference between Baseline emission and Project emission & Leakage emission.

Thus, as per equation 9 of AMS I.D Version 18

$$ER_y = BE_y - PE_y - LE_y$$

Where,
ERy = Emission Reduction in year (tCO2e/year)
BEy = Baseline emissions in year (tCO2e/year)
PEy = Project emissions in year (tCO2e)
LEy = Leakage emissions in year y (tCO2e)

I.6.2. Data and parameters fixed ex ante

Data/Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2/MWh
Description	Operating Margin CO_2 emission factor in year y
Source of data	The most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, issued on Mar 2020.
Value(s) applied	0.8795
Choice of data or Measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0.0" as 3-year generation weighted average using data for the years. The data are obtained the most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, dated Mar 2020
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire first crediting period as stated, therefore value is provided above.

Data/Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2/MWh
Description	Build Margin CO2 emission factor in year y
Source of data	The most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, issued on Mar 2020.
Value(s) applied	0.9465
Choice of data or Measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0.0". The data are obtained the most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, dated Mar 2020
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire first crediting period as stated, therefore value is provided above.

Data/Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined Margin CO2 emission factor in year y
Source of data	The most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, issued on Mar 2020.
Value(s) applied	0.89625

Choice of data or Measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0.0". The data are obtained the most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, dated Mar 2020.
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire crediting period.

I.6.3. Modalities for ex ante calculation of emission reductions

>>

Thus, as per equation 9 of AMS I.D Version 18

$$ER_y = BE_y - PE_y - LE_y$$

Where,
ERy = Emission Reduction in year (tCO2e/year)
BEy = Baseline emissions in year (tCO2e/year)
PEy = Project emissions in year (tCO2e)
LEy = Leakage emissions in year y (tCO2e)

Baseline Emission (BE_Y)

The baseline emissions are the product of electrical energy baseline $EG_{facility,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by an emission factor.

$$BE_Y = EG_{facility,y} * EF_{grid,CM,y}$$

Where,
$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

CPA Investor's Name	Capacity	PLF (%)	Generated Power (MWh) p.a	Baseline Emission Factor (tCO2/MWh)	Baseline emissions (tCO2/ year)

$EF_{grid,CM,y}$ = Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO2/MWh).

$BE_y = EG_{BLy} \times EF_{CO2,y}$
Where

- BE_y = Baseline emissions in year y (t CO2)
- EG_{Bly} = Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year y (MWh)
- $EF_{CO2,y}$ = Emission factor (t CO2/MWh)

BE_y = xxxx * xxxx = xxxx

As per Section I.6.1:
$PE_y = 0$
$LE_y = 0$

Thus,
$ER_y = BE_y - PE_y - LE_y$
$ER_y = BE_y - 0 - 0$

$ER_y = BE_y$

Therefore,
ER_y = **xxxx**

I.7. Monitoring plan

I.7.1. Data and parameters to be monitored

Data/Parameter	**$EG_{PJ,,y}$ or $EG_{facility,y}$**
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)
Source of data	Credit Report /JMR as per Monthly Generation Report
Value(s) applied	XXX (Actual monitored Value from electricity sold invoice, specific to CPA)
Measurement methods and procedures	Data Type: Measured and Calculated Monitoring equipment: Electronic tri-vector and Bi-directional Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: One in two years Electricity exported/imported to the grid is in kWh. However, for the calculation purpose electricity exported is converted in MWh. The Bi-directional energy meter measures both export and import of CPA. The Net electricity supplied to the grid by the CPA will be calculated as a difference of electricity exported to the grid, electricity imported from the grid obtained from joint meter reading certificates/credit notes issued by the Electricity regulatory Authority of the Host Party as per below equation: $EG_{PJ,,y} = EG_{Export} - EG_{Import}$ The joint reading at metering point is carried out once in a month in presence of O&M officials and Electricity Regulatory Authority personnel. The calculations/measurement of net electricity supplied to grid is under purview of the respective country's group energy/electricity regulatory board and the CPA Owner will get value of net electricity supplied to grid and hence this parameter is mentioned as a part of monitoring plan. Cross Checking: Quantity of net electricity supplied to the grid will be cross checked from the invoices raised by the respective country's Electricity Regulatory Authority or invoices with third party.
Monitoring frequency	Monthly
QA/QC procedures	The calibration of all the meters will be undertaken at required intervals and faulty meters will be duly replaced immediately. The meters will be of accuracy class 0.2s or 0.5s. The meter accuracy class and calibration interval are under purview of the respective country's group energy/electricity regulatory board and CME/CPA owner do not have any control on it. It is also noted that apportioning procedure (if applicable for CPA) is under control of the respective country's group energy/electricity regulatory board and PP do not have any control on it. The available parameter to CME/CPA owner is the net electricity supplied to grid and same parameter is mentioned as monitoring parameter. Wherever possible, the net electricity supplied to grid can be compared with project site meters (controller meter) data.
Purpose of data	The Data/Parameter is required to calculate the baseline emission

Additional comment	Data will be archived electronically for a period of 2 years beyond the end of crediting period.

I.7.2. Sampling plan

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N/A

I.7.3. Other elements of monitoring plan

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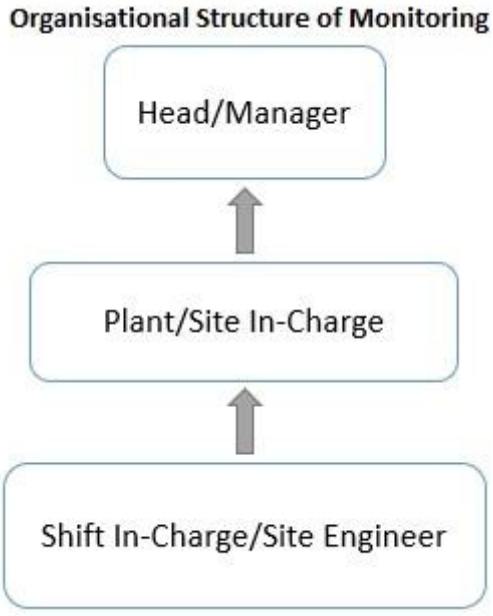
The monitoring plan is developed in accordance with the modalities and procedures for CDM project activities and is proposed for grid-connected renewable energy power project (Solar PV) being implemented within the boundary of Vietnam. The monitoring plan, which will be implemented by the CME describes about the monitoring organisation, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage and archiving.

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data results with the CME. CME proposed the following structure for data monitoring, collection, data archiving and calibration of equipment for this CPA. The team comprises of the following members:



CME has assigned the responsibility of operation and maintenance of CPA with relevant and authorised O&M contractors. The Plant In-charge and Shift In-Charge would be deployed by O&M contractors.

Organizational Structure for monitoring:

Designation	Responsibilities
Head / Manager	• Overall functioning and maintenance of the CME • Holds complete control over monitoring aspects pertaining to the project
Plant / Site In-Charge	Maintains the data records, reliability of data (calibration of equipment) and ensures completeness of data such as: • Recording • Verification • Storage of Data
Shift In-Charge / Site Engineer	Responsible for day to day maintenance of:

	• Data collection • Log book for monitored data • Storage of Data

The CPA having dedicated metering which directly measures quantity of net electricity supplied and same is considered for ER calculations. For CPA having common metering, the apportioning procedure will be followed as mentioned below to determine the parameter net electricity supplied to grid.

For CPAs which involves apportioning procedure due to common metering arrangement for solar projects:

In case of common metering arrangement, the CPA have monitoring system at project site/pooling station and at substation.

The metering is carried out at the substation via a common meter for a group of solar PV projects that is inclusive of the project activity and other than project activity.

The primary monitoring is done through a main meter which is located at the substation. Also, each project activity measures electricity at project site/pooling station.

Only the final apportioned electricity export and import for each project would be reported by national electricity board or by O&M service providers and endorsed by national electricity board in the JMRs. JMRs are taken at the substation level by the local electricity utility. Against the net electricity generation invoices are raised.

O&M service providers maintain all the individual project activity readings at projects site. After recording the Joint Meter values every month, in presence of the National Electricity Board personnel, O&M contractor apportions the generation values for each of the project activity accordingly (based on the project site/pooling station electricity data).

The apportioning of electricity export and import for each project activity is derived from project site/pooling station data. The net electricity generation from each project activity is determined as follows:

$EG_{PJ,y} = EG_{project\ site\ CPA}$ X Total $(EG_{export} – EG_{import}) / EG_{project\ site,\ total}$

Where,

$EG_{PJ,y}$ = Quantity of net electricity supplied to the grid from the CPA

Total $(EG_{export} - EG_{import})$ = Total net export value of all project activity connected to substation

$EG_{project\ site\ CPA}$ = electricity generation at project site/pooling station by CPA

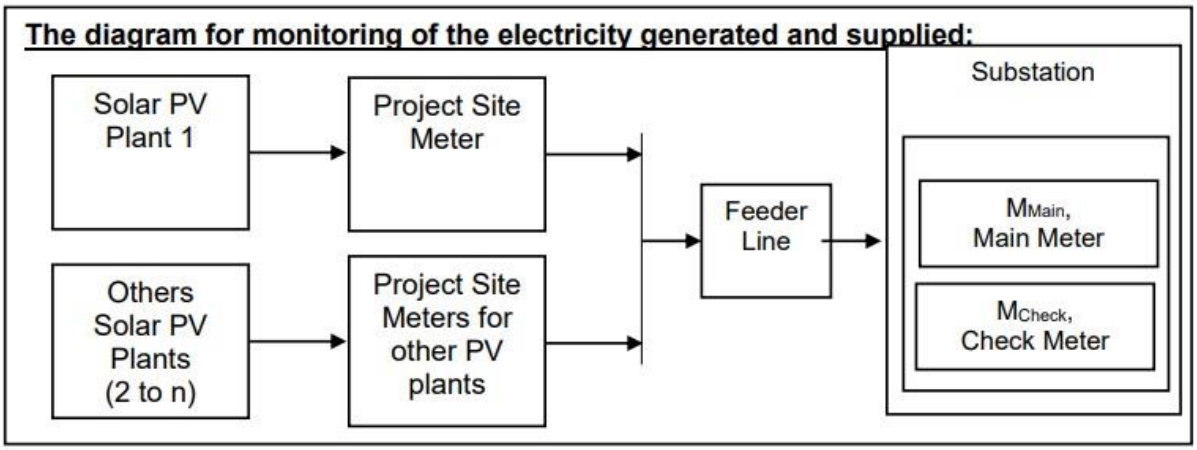
EG_{import} = Total import at sub station

EG_{export} = Total export at sub station

$EG_{project\ site,}$ total = Total electricity generation at project site/pooling station of all project activities which are connected to sub station

In general, for apportioning the common meter export/import reading at substation and ratio of respective project activity reading to all power plants (inclusive of project activity and other than project activity) reading will be used.

The schematic representation of common metering is represented as below:



In case of dedicated metering, CPA will have dedicated meters and there is no common metering involved.

The export and import of respective CPA can be determined separately by using above formula with consideration of only export or import of substation as applicable.

The above apportioning procedure (in case of common metering) will be according to Vietnam's regulations and may not be within the control of the CPA Owner or CPA Implementer. The above procedure involves two stage metering (controller/project site meter data and substation meter data). Net electricity supplied to grid will be calculated accordingly.

Since there is variation in apportioning procedure from country to country, specific CPA will mention such apportioning procedure (if applicable) based on location of CPA.

QA & QC Procedures to be followed

Necessary check meters as required would be installed, to operate in standby mode or when the main meters are not working. All meters will be calibrated at least once in two year as per CPA notification. Records of calibration certificates will be maintained for verification. Hence, high quality is ensured with the above parameters. The calibration of meters is under purview of national electricity board and CME/CPA owner do not have any control on it.

Data Recording and Storage

For measuring the net energy supplied to grid by the CPA at the interconnection point, one set of Main meter and Check Meter shall be provided. Representatives of both CME/CPA Owner and National Utility will be present to record the monthly meter readings. The National utility will prepare the credit report for the net energy supplied to the grid and same will be used as a basic document for monitoring and verification of the net energy supplied to the grid. Based on the monthly credit report, the CME/CPA Owner shall raise an invoice to the utility. Utility will pay to the CME/CPA Owner based on this document. The above document will be kept at safe storage for verification of emission reductions generated from the project activity. The period of data storage will be 2 years beyond crediting period.

Emergency preparedness

The project activity will not result in any unidentified activity that can result in substantial emissions from the project activity. However, in case monitoring equipment get failed or found faulty, they shall be replaced with calibrated meters as quickly as possible. In case main meter get failed or found faulty, the reading of check meter will be considered.

Personnel training

In order to ensure a proper functioning of the CPA and a properly monitoring of emission reductions, the staff will be trained. The Shift In-charge and Plant In-charge will be trained in equipment operation, data recording, operation and maintenance and emergency procedures in compliance with the monitoring plant.

SECTION J. Crediting period type and duration

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7 years and renewable 3 times equating to 21 years or 252 months.

SECTION K. Eligibility criteria for inclusion of CPAs

>>

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion
1	Geographical boundaries of CPAs consistent with the geographical boundary of the PoA;	The geographical boundary of the CPA area is uniquely defined and within the boundary of Vietnam.	• Feasibility study report or • Third party PLF assessment report or • Land documents, or • Commissioning certificates, or • Permission from regulatory authorities or • Relevant equivalent document
2	Conditions to avoid double counting of GHG emission reductions or net anthropogenic GHG removals	The CPA must not be part of any other PoA or will not be registered as individual CPA under any other emission reduction scheme or programme, or deregistered CDM project activity	• Inclusion Contract • and cross-checked on UNFCCC website by CME • CPA implementer confirmation
3	Conditions to confirm that CPAs are neither registered as CDM project activities, included in another registered PoAs, nor the project activities that have been deregistered;	The CPA must not be part of any other PoA or will not be registered as individual CPA under any other emission reduction scheme or programme, or deregistered CDM project activity	• Inclusion contract • Cross-check on UNFCCC project cycle • CPA implementer confirmation

4	Specification of the technology/measure	Technology for solar PV array use for CPAs consisting of either: - Monocrystalline Solar Panels (Mono-SI) - Polycrystalline Solar Panels (p-Si) - Thin-Film: Amorphous Silicon Solar Panels (A-SI) - Concentrated PV Cell (CVP) The Solar PV system will include: -Mounting structures (potentially also including tracking system) -Junction box, distribution boxes and DC (direct current) cabling connecting modules with inverters -Inverters -Production meter on AC (alternating current) inverter output side (integrated to inverter) -Data logger and/or gateway to internet (potentially integrated to inverter) -Transformers -Circuit breakers -System for control and monitoring -Grid utility meter Evacuation system / grid connection system The capacity range of Case 4's entire system will be ≤ 5 MW. Electricity produced by the project activity will be monitored at the point it is exported to the grid. The technology shall have Approval / certification from the relevant designated authority. All the equipment of each CPA will be complying with applicable national/ international standards.	• Inclusion contract • Feasibility study report or • Offer from the party providing the equipment / construction / operation services proving that the CPA is greenfield CPA. • Power Purchase Agreement / Wheeling Agreement or the Approval from the relevant local authority or • Purchase Orders /Work Order / contract with party Providing equipment / construction /operation services. • CPA-DD

5	Conditions to check the start dates of CPAs;	The CPA only started after the start date of the PoA. The start date of the PoA is considered as **24/07/2018** which is the intimation of prior CDM consideration to UNFCCC & the relevant country's' DNAs. Therefore, start date of the CPA must be later than 24/07/2018	• Purchase orders/contracts for equipment or construction/operation services or any other documents as stated in the Glossary of CDM terms
6	Conditions to ensure compliance with the applicability of the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents;	Project Activity will compromise of only AMS I.D, where it will: 1. Be an installation of a Greenfield Plant 2. Have a plant capacity of ≤5MW 3. Only consist of Solar PV technology 4. Have all energy generated directed to the grid.	• Inclusion contract • Feasibility study report or • Offer from the party providing the equipment / construction / operation services proving that the CPA is greenfield CPA. • Power Purchase Agreement / Wheeling Agreement or the • Approval from the relevant local authority or Purchase Orders /Work Order / contract with party Providing equipment / construction /operation services. • CPA-DD
7	Condition to ensure the CPA meet the requirement for demonstration of additionality.	Micro scale CPAs shall be photovoltaic project and shall be automatically additional as per positive list state as per para 11, in the tool 'Demonstration of additionality of small-scale project activities' version 13.0 Installed capacity to be confirmed by Inclusion Contract and documentary evidence; CME carries out further plausibility checks based on monitoring data	• Inclusion contract • Detailed Project Report prepared by third party • CPA-DD • Feasibility report
8	Conditions related to undertaking local stakeholder consultation and environmental impact analysis;	The CPA shall conduct a local stakeholder consultation and environmental impact assessment according to local regulation. This will be reviewed by CME at CPA level	• Inclusion contract • Environmental impact assessment report • Environmental impact assessment approval • Minutes of meeting of local stakeholder consultation, • attendance records, invitation letters etc.

9	Conditions to provide an affirmation that funding from Annex I Parties, if any, does not result in a diversion of official development assistance;	The CPA shall not involve funding from Annex I parties that results in a diversion of official development assistance.	• Undertaking from CPA Owner or CPA Implementer.
10	Target group (e.g. domestic/commercial/industrial, rural/urban, grid-connected/off grid), and where applicable, distribution mechanisms (e.g. direct installation);	The CPA supplies electricity to the national/regional grid or uses national grid for captive or third-party sale	• Power Purchase Agreement • Grid Evacuation approval/agreement • Wheeling Agreement, or • DPR or CPA
11	CPA remain within SSC threshold	Each CPA will have a maximum capacity of 5MW per year throughout the CPA's crediting period	• Inclusion contract • CPA-DD
12	Condition of de-bundling check	Small-scale CPA is not de-bundled part or larger activity CPA owner confirms by Inclusion Contract that within the previous 2 years no other of his PV plants located in a distance of less than 1 km has been registered as CDM project or included as CDM CPA to a PoA	• Inclusion contract • Undertaking from CPA Owner or CPA Implementer.

PART II. Generic component project activity (CPA)

Case 5: Micro-Scale Captive Consumption CPAs (MCC)

SECTION H. Description of generic CPA

H.1. Title of generic CPA

>>
SUNSEAP Micro-scale Captive Consumption CPA by {entity name} [location]

H.2. Reference number of generic CPA

>>
CRX-SUNSEAP/[Country]/MCC-X,

where,
Country = Host Party

X = 1 and above.

For example, the 1st large scale CPA and if hosted in Vietnam will bear the reference number CRX-SUNSEAP/Vietnam/MCC-1.

H.3. Purpose and general description of generic CPA

>>
[Insert CPA Title here] is a proposed Micro-Scale Component CPA involves the installation of Captive Consumption solar photovoltaic (Solar PV) power plant in **[insert location]**. The total installed capacity of the project activities under CPA is **[insert installed capacity (MWp)]** and is designed to contribute to the improvement of power output from renewable energy sources for **[insert Host Party regional location]** in particular and **[insert Host Party]** in general, contributing to affirm the responsibility of [Host Party] to the international community in environment protection.

CPA implementation time: From **[insert timeframe]**, detailed implementation plan is as follows:

No.	Article V. Works items	Expected completion time
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

The electricity generated by the CPA would displace equivalent amount of electricity generated by the operation of existing/ grid connected power plants (mostly fossil fuel-based power plants) and by addition of new generation sources into the grid. The CPA, thus, reduces the anthropogenic emissions of greenhouse gases (GHGs) into the atmosphere associated with the equivalent amount of electricity generation from the existing grid connected power plants (mostly fossil fuel) and by addition of new generation sources into the grid.

The CPA is expected to generate an average of **[insert calculated figure] MWh/year** which will result in the average emission reductions of **[insert calculated figure] tonnes** of CO2 every year.

In addition, the CPA will improve the socio-economic progress of each nation by generating employment opportunities as well as achieving several of the UN's Sustainable Development Goals of 2015.

According to paragraph 128, Project Standard for PoA, version 02.0, this CPA is a Type I project activity, Type I Micro scale project activities are "Renewable energy project activities with a maximum output capacity of 5 MW (or an appropriate equivalent)".

Contribution of CPA to Sustainable Development:

The CPA contributes to the improvement in conditions of local areas near by the surroundings of the CPA and contributes to sustainable development through below mentioned factors.

Environmental well-being:

- The CPA, by using solar energy as the renewable energy source, replaces/displaces energy generated from fossil fuels and thereby avoiding emission of greenhouse gases (GHGs) and other gases like SOx, NOx and particulate matter.
- Encourage industrial development in the region and generate economic growth.

Economic well-being:

- Implementation of solar PV technology-based CPA under the PoA will result in employment opportunities for people involved with installation of renewable energy technologies.
- The implementation of CPA will also help in reducing demand-supply gap of electricity in the country.

Social well-being:

- The solar CPA involves generation of electricity utilizing solar PV technology without emitting GHGs into atmosphere. This reduces the adverse impact of GHG emissions leading to cleaner environment.
- The CPA will create the employment opportunities for the local people during the installation of the renewable energy.
- Sales of carbon credits generated by the CPA will result in increased foreign direct investment;

Technological well-being:

- The CPA will use environment friendly, inexhaustible and clean solar energy.
- It will create opportunities for skill improvement and technology penetration in the Host Party.

Location of CPA
[insert map of project location]

[Insert location and coordinates of project activity]

H.4. Technologies/measures

>>

The project will utilize solar energy to generate no GHG emissions electricity by PV array. The CPA involves the installation of **[insert plant capacity (MWp)]** solar power project in **[insert project location]**.It is estimated that the annual average net generating electricity of the CPA is **[Insert Calculated Figure]** MWh, taking account of significant related factors as solar cell array efficiency, inverter efficiency and AC gird-connected efficiency.

Solar energy collectors and converters are solar cell modules, which directly convert solar energy into direct current through the photovoltaic effect. Thanks to the inverters, the DC is converted into AC. A PV module consists of multiple solar modules connected, which can have capacity range from several dozen (W) to several tens of megawatts (MW). The inverter connected to each group will convert direct current (DC) into alternating current (AC). The post-converted power is supercharged to 110kV using transformers and exported to the Vietnamese national grid via load lines and electricity metering systems.
For PV modules manufactured for commercial purposes, the photovoltaic conversion efficiency of PV modules ranges from 14% to 20%.

A PV power production unit may in general constitute the following equipment:

- Solar PV array consisting of either:
  - Monocrystalline Solar Panels (Mono-SI)
  - Polycrystalline Solar Panels (p-Si)
  - Thin-Film: Amorphous Silicon Solar Panels (A-SI)
  - Concentrated PV Cell (CVP)
- Mounting structures (potentially also including tracking system)
- Junction box, distribution boxes and DC (direct current) cabling connecting modules with inverters
- Inverters
- Production meter on AC (alternating current) inverter output side (integrated to inverter)
- Data logger and/or gateway to internet (potentially integrated to inverter)
- Transformers
- Circuit breakers
- System for control and monitoring
- Grid utility meter
- Evacuation system / grid connection system

This technology is emerging as a plausible alternative in this country due to the following key factors:

- Increasingly insufficient and inadequate electricity supply to meet demand.
- Enhanced cost competitiveness of solar PV, being brought about not just through falling costs for PV equipment, but also the availability of climate finance to reduce the cost of capital.
- Shorter relative lead times associated with delivering projects compared to other capital-intensive generation technologies, including fossil fuel-based alternatives.

Need for diversification of energy supply options to reduce risks associated with reliance upon fossil fuel imports.

Electricity produced by the project activity will be monitored at the point it is exported to the grid. Equipment used in the project activity has an average lifetime of **[Insert CPA Lifetime here]** years.

The annual operation time of the proposed project is estimated to be about **[Insert total sun hours]** hours and the plant load factor (PLF) of the proposed project is **[insert PLF]** %, and an efficiency of **[insert efficiency]**%. The annual net grid-in electricity is estimated to be **[Insert calculated figure]** MWh which contributes to the reduction of GHG emission by replacing parts of the electricity supply by the **[insert Host party's energy board]**.

The baseline scenario of the proposed project is the same as the scenario prior to the start of implementation of the CPA. The electricity generated by the CPA will be transmitted to the main transformer of a newly built substation and then be connected into the grid.

The principal component of the CPA involves the Solar (PV) modules, inverters, transformers and electricity meters; further details are included below. The technical specifications of modules and inverters used for the CPA under the CPA are given below.

The key technical parameters of the main equipment are shown as follows:

[Insert PV modules, transformer and inverter technical specification]

SECTION I. Application of methodologies and standardized baselines

I.1. References to methodologies and standardized baselines

>>
In case of small-scale projects, i.e. CPAs with total installed capacity ≤ 5 MW:
The below methodology is used
Title: AMS-I.F. - Renewable electricity generation for captive use and mini-grid --- Version 3.0

Tools applied in conjunction with AMS I.F:

- Tool to calculate the emission factor for an electricity system, version 07
- Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation, Version 03.0
- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion, Version 03.0

I.2. Applicability of methodologies and standardized baselines

>>
Each Micro-Scale CPA under PoA will meet the applicability conditions of the approved consolidated baseline and monitoring methodology AMS I.F, Version 3.0, as described below:

Applicability Conditions	Compliance Status
This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to user(s). The project activity will displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit i.e. in the absence of the project activity, the users would have been supplied electricity from one or more sources listed below: (a) A national or a regional grid (grid hereafter); (b) Fossil fuel fired captive power plant11[20]; (c) A carbon intensive mini-grid.	**Yes** The CPA under PoA will be a Renewable Energy Project (i.e. solar photovoltaic) which will displace electricity from an electricity distribution system that is or would have been supplied by at least least one fossil fuel fired generating unit i.e. in the absence of the project activity, the users would have been supplied electricity from one or more sources listed below: (a) A national or a regional grid (grid hereafter); (b) Fossil fuel fired captive power plant. Users of such captive electricity will also be connected to the grid, in compliance with footnote 1 of AMS-I.F version 3.0 methodology/ footnote 21 of this PDD, (c) A carbon intensive mini-grid
Illustration of respective situations under which each of the methodology (AMS-I.D., AMS-I.F. and AMS-I.A.2) applies is included in Table 3.	**Yes.** The 2nd option of Table 1[21] of AMS I.F. Version 3, is applicable when CPA under PoA Project

[20] Where the users of the captive electricity are also connected to the grid in the project site

[21]

	Project type	AMS-I.A	AMS-I.D	AMS-I.F

	displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid).
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: (a) The project activity is implemented in an existing reservoir with no change in the volume of reservoir; (b) The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m2; (c) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2.	**Not applicable.** This PoA does not involve Hydro Power, hence this criterion is not applicable to the CPA.
This methodology is applicable for project activities that: (a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) Involve a capacity addition,	**Yes** Any CPA under this PoA is installation of a new captive consumption renewable energy power plant (solar PV) at a site where no renewable power plant was operated prior to the implementation of the project activity

1	Project supplies electricity to a national/regional grid		√	
2	Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)			√
3	Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)		√	
4	Project supplies electricity to a mini grid11 system where in the baseline all generators use exclusively fuel oil and/or diesel fuel			√
5	Project supplies electricity to household users (included in the project boundary) located in off grid areas	√		

(c) Involve a retrofit of (an) existing plant(s); or (d) Involve a replacement of (an) existing plant(s).	(Greenfield plant) and hence the first criterion is applicable.
In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	**Not applicable** The CPA under the PoA will be a new Captive Concumption renewable energy plant (Solar PV) and not a retrofits, replacement or capacity additions and therefore this criterion is not applicable to the project activity.
In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	**Not applicable** The CPA under PoA will be Greenfield project and there is no existing power generation facility at the site. Hence the criteria is not applicable to the PoA or CPA.
If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	**Not applicable** CPA under PoA will have capacity within eligibility limit of 5 MW and will involve only renewable component (solar PV). Unit does not co-fire fossil fuels. Hence the criterion is not applicable to the CPA.
Combined heat and power (co-generation) systems are not eligible under this category.	**Not applicable** CPAs under this PoA is purely Solar PV, therefore this criterion is not applicable.
If electricity and/or steam/heat produced by the project activity is delivered to a third party, i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered that ensures that there is no double counting of emission reductions.	**Yes** If energy produced by the project activity is delivered to a third party, a contract between supplier and consumer will be entered into to ensure no double counting of emission reductions.
In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply.	**Not applicable.** The PoA is a renewable energy power project which involves solar PV and is not a biomass project. Hence the criteria is not applicable to the PoA or CPA.

According to paragraph 128, Project Standard for PoA, version 02.0, this CPA is a Type I project activity, Type I Micro scale project activities are "Renewable energy project activities with a maximum output capacity of 5 MW (or an appropriate equivalent)". This will be one of eligibility criteria for inclusion of CPA.

I.3. Application of multiple methodologies

>>

ASM I.F (in its latest version at the time of PoA registration) is the only methodology applied to this CPA.

I.4. Project boundary, sources and greenhouse gases (GHGs)

>>

Project boundary has been ascertained using para 17 of AMS I.F (Version 3.0, EB 81)

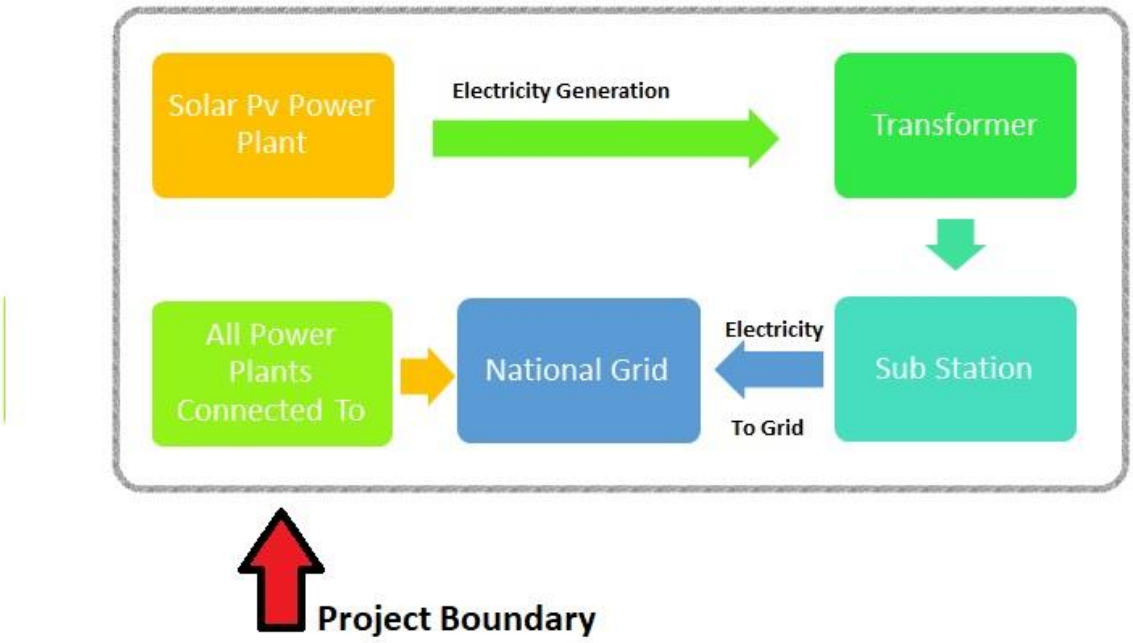
The spatial extent of the project boundary includes industrial, commercial facilities consuming energy generated by the system. In the case of electricity generated and supplied to distributed users (e.g. residential users) via mini/isolated grid(s) the project boundary may be confined to physical, geographical site of renewable generating units. The boundary also extends to the project power

plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

Hence the project boundary includes the renewable energy power plant, sub-stations, grid and all power plants connected to grid. The proposed CPA will evacuate power to the grid.

The calculation of net electricity supplied to captive-grid is under purview of Electricity Regulatory Authority of the host party, based on which the invoicing for net electricity sold will be calculated; the electricity value to be used for emission reduction calculations will be based on invoices submitted to and approved by relevant host party. Thus, for the CPA, net electricity supplied to the applicable grid in the host party is a monitoring parameter which is used for ER calculations.

The schematic representation of project boundary for grid connected CPAs is represented as below:



Source		GHG	Included ?	Justification/Explanation
Baseline	CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the CPA.	CO_2	Yes	Major emission sources.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
		---	---	---
Project activity	CO2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	CPA does not involve solar thermal or geothermal power plants. Hence not applicable.
		CH_4	No	CPA does not involve solar thermal or geothermal power plants. Hence not applicable.
		N_2O	No	CPA does not involve solar thermal or geothermal power plants. Hence not applicable.
		---	---	---

I.5. Establishment and description of baseline scenario

>>
As per the approved consolidated methodology AMS I.F, Version 3, para 2

The CPA only applies to displace electricity from an electricity distribution system that is or would have been supplied by at least national or regional grid, fossil fuel fired captive power plant or carbon intensive mini grid.

As per para 18 of AMS I.F, Version 03, for a mini-grid system where all generators use exclusively fuel oil and/or diesel fuel, the baseline emissions is the annual electricity generated by the renewable energy unit times an emission factor for a modern diesel generating unit of the relevant capacity operating at optimal load as table 2 of AMS I.F Version 03.

The project activity would replace the weighted average of the ratio of emissions in the system represented by:

a) **Operating Margin (OM)**
The ratio of all power generating projects in the defined system over the latest three-year period excluding least cost/must run projects.

b) Build Margin (BM)
The generation-weighted average emission factor of all power units *m* during the most recent years *y* for which power generation data is available.

c) **Combined Margin (CM)**
Default values established in the 'Tool to calculate the emission factor of an electricity system' for the weighting of the OM (W_{om}=75%) and for the weighting of the BM (W_{BM}=25%).[22]

Variables	Values	Source
Operating Margin Emission Factor	0.8795 tCO_2/MWh	Ministry of Natural Resources and Environment Vietnam (Most Updated Figure)[23]
Build Margin Emission Factor	0.9465 tCO_2/MWh	
Combined Margin Emission Factor	0.89625 tCO_2/MWh	Calculated as section below

During the last 25 years Vietnam's economic growth reached more than 6% each year. At the same time, the energy demand increased almost twice as fast as the GDP. With an expected continuous increase of energy demand in the next years, Vietnam's energy sector will have to face many challenges, such as limited domestic fossil resources, air pollution and climate change, causing amongst other things water scarcity. Vietnam has been ranked among the five countries, that will be most affected by climate change.

Another issue is the country's unreliable power supply, especially in rural areas. In order to face these challenges, legislative conditions have to be adopted and the framework conditions for investments have to be reformed to strengthen foreign investments and eventually stimulate the expansion of renewable energy generation capacity.

In relation to the first CPA-DD in Vietnam, Vietnam's GHG mitigation activities prior to 2020 as stated in its INDCs, 'Viet Nam's INDC identifies the GHG reduction pathway in the 2021-2030 period. With domestic resources GHG emissions will be reduced by 8% by 2030 compared to the Business as

[22] As per Tool 7 : Tool to calculate the emission factor for an electricity system Ver.7.0, Section 6.6.1 Para 86 (a)

[23] Grid emission factor for Vietnam, 2020, http://dcc.gov.vn/van-ban-phap-luat/1059/Nghien-cuu,-xay-dung-he-so-phat-thai-(EF)-cua-luoi-dien-Viet-Nam-(K%C3%A8m-CV-263/BDKH).html

Usual scenario (BAU). The above-mentioned contribution could be increased up to 25% with international support.'.

The CPA involves setting up of renewable energy technology (solar PV) to produce renewable electricity and supply to the end users. In the absence of the CPA, the equivalent amount of electricity would have been supplied by the country's National grid, which is fed mainly by fossil fuel fired plants.

In the absence of the CPA, the equivalent amount of electricity would have been drawn from the state grid. Hence, the baseline for the CPA is the equivalent amount of power from the respective country's National Grid.

I.6. Estimation of emission reductions

I.6.1. Explanation of methodological choices

>>

As per para 18 of AMS I.F, Version 03, for a mini-grid system where all generators use exclusively fuel oil and/or diesel fuel, the baseline emissions is the annual electricity generated by the renewable energy unit times an emission factor for a modern diesel generating unit of the relevant capacity operating at optimal load as table 2 of AMS I.F Version 03

Table 2. Emission factors for diesel generators systems (in kg CO2e/kWh) for three different levels of load factors.

Cases	Mini-grid with 24 hour service	(a) Mini-grid with temporary service (4-6hr/day); (b) Productive applications; (c) Water pumps	Mini-grid with storage
Load factor [%]	25%	50%	100%
< 15 kW	2.4	1.4	1.2
>=15 < 35 kW	1.9	1.3	1.1
>=35 < 135 kW	1.3	1.0	1.0
>=135 <200 kW	0.9	0.8	0.8
>200 kW	0.8	0.8	0.8

(a) A conversion factor of 3.2 kg CO2 per kg of diesel has been used (following revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories);
(b) Values derived from figures reported in RETscreen International's PV 2000 model retrieved from: http://retscreen.net/
(c) Default values

As per para 19 of AMS I.F Version 3, Baseline emissions for other systems are the product of amount electricity displaced with the electricity produced by the renewable generating unit and an emission factor. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{BL,y} \times EF_{CO2,y}$$

Where,

BE_y	=	Baseline Emissions in year y; (tCO2 /yr)
$EG_{BL,y}$	=	Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{CO2,y}$	=	Emission factor (tCO2/MWh) Based on scenario of CPA, the below relevant optiona need to be select for calculation of emission factor

		4. Emission factor of a grid shall be calculated as per the procedures provided in AMS-I.D i.e by using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO_2/MWh) 5. For a mini-grid system other than described in paragraph 18 above, the baseline emission factor shall be determined as per the weighted average emissions for the current generation mix following the procedure provided in AMS-I.D 6. Emission factor for captive electricity generation shall be calculated as per the procedures described in the latest version of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation"

As per para 20 of methodology, for project activities that displace grid electricity and fossil fuel fired on-site captive electricity, the baseline emission factor should reflect the emissions intensity of the grid and the captive power plant in the baseline scenario i.e. the weighted average emission factor for the displaced electricity is calculated using values based on the historical, prior three year ratios of electricity from captive plants and the grid. For new facilities, the most conservative (lowest) of the emission factor for the two power sources should be used.

As per option 1 above, the emission factor is calculated as combined margin emission factor as per methodology AMS I.D version 18 which further refers "Tool to calculate the emission factor for an electricity system, version 07"

The combined margin ($EF_{grid,CM,y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) and build margin (BM). Calculations for this combined margin must be based on data from an official source.

Calculation emission factors of the Vietnamese national grid $EF_{grid,CM,y}$
For solar power plants, emission factors are calculated using:

- Most updated national data: Data on Vietnamese national grid emission factors published by Vietnam DNA, Department of Climate Change, Ministry of Natural Resources and Environment with official letter No. 263/BDKH on 12 March 2020 on "Vietnam grid emission factor 2018"
- The most updated emission factor calculation tool: Version 07.0 of the "Tool to calculate emission factor for an electricity system"

Emission factor of Vietnamese national grid is calculated and published by Vietnam DNA, Department of Climate Change, Ministry of Natural Resources and Environment (Official Dispatch No. 263/BDKH dated 12 March 2020), including:

Variables	Values	Source
Operating Margin Emission Factor	0.8795 tCO_2/MWh	Ministry of Natural Resources and Environment Vietnam (Most Updated Figure) [24]
Build Margin Emission Factor	0.9465 tCO_2/MWh	

The combined margin emissions factor is calculated as follows:
$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$
In which:
$EF_{grid,CM,y}$ = Combined margin CO2 emission factor of Vietnamese national grid in year y (tCO2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO2 emission factor of Vietnamese national grid in year y (tCO2/MWh)
w_{OM} = Weighting of operating margin emissions factor (%)

[24] Vietnam's Grid emission factor for Vietnam, 2020, http://dcc.gov.vn/van-ban-phap-luat/1059/Nghien-cuu,-xay-dung-he-so-phat-thai-(EF)-cua-luoi-dien-Viet-Nam-(K%C3%A8m-CV-263/BDKH).html

$EF_{grid,BM,y}$ = Build margin CO2 emission factor of Vietnamese national grid in year y (tCO2/MWh)
w_{BM} = Weighting of build margin emissions factor (%)

However, the report of the DNA of Vietnam applying the weighting of margin emission factor and build margin emission factor is 0.5, this weighting is not applicable to solar power plants. According to version 07.0 of the "Tool to calculate the emission factor for an electricity system", the following default weights are applied to solar power plants:
w_{OM} = 0.75 and w_{BM} = 0.25

Therefore, the combined margin emissions factor for solar power plants are calculated as follows:
$EF_{grid,CM,y}$ = 0.75 x 0.8795 + 0.25 x 0.9465 = 0.89625 (tCO2/MWh)

The value fixed for the first crediting period will be **0.89625 tCO2/MWh** with no need to update. This combined margin emission factor will remain fixed for first crediting period of this PoA and will be updated during second and third crediting period.

For option 2 of emission factor In case of CPA involves a mini-grid system other than described in paragraph 18 of AMS I.F version 03 , the baseline emission factor shall be determined as per the weighted average emissions for the current generation mix following the procedure provided in AMS-I.D. The value of this parameter will be determined based on specific mini grid involved in the CPA.

For option 3 of emission factor, latest version of the methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” version 3.0 is referred. As per tool, Scenario C is applicable (Case C.III), because this Option 3 of emission factor from captive electricity generation also has to include users being connected to grid electricity in the baseline scenario (as per footnote 1 of AMS-I.F version 3.0)

Scenario C: Case C.III: Electricity consumption both the grid and fossil fuel fired captive power plant(s).

As per paragraph 31 of the tool, where this case C.III has been identified as a conservative approach, the emission factor for electricity generation should be the more conservative value between the emission factor determined as per scenario A and B respectively.

- Scenario A: Emission factor for electricity generation from grid: **0.89625 tCO2/MWh** (see option 1 procedure above)

- Scenario B: Emission factor for electricity generation from captive power plant: CPA selects Option B2 (b) as per para 28 of tool ““Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” version 3.0”, where a value of **0.4 tCO_2/MWh** is chosen as the emission factor

Hence, the more conservative value chosen between Scenario A and B for this case would be **0.4 tCO_2/MWh**

Project Emissions: For most renewable power generation projects activities PE_y =0. As per applied methodology only emission associated with the fossil fuel combustion due to release of non-condensable gases, should be accounted for the project emission.

Leakage Emissions: No Leakage emissions are considered. The main emission potentially giving rise to leakage in the context of electrical sector projects is emission arising due to activities arising such as power plant construction and upstream emission from fossil fuel use (e.g. extraction, processing, and transport). These emission sources are neglected.
Hence, LE_y= 0

Emission reduction (ERy): The CPA mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plant by renewable electricity. The emission reduction ERy by the CPA during a given year y is the difference between Baseline emission and Project emission & Leakage emission.

Thus, as per equation 2 of AMS I.F Version 3

$$ER_y = BE_y - PE_y - LE_y$$

Where,
ERy = Emission Reduction in year (tCO2e/year)
BEy = Baseline emissions in year (tCO2e/year)
PEy = Project emissions in year (tCO2e)
LEy = Leakage emissions in year y (tCO2e)

I.6.2. Data and parameters fixed ex ante

Parameters for CPA involving solar photovoltaic projects where electricity displaces from national/regional grid

Data/Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2/MWh
Description	Operating Margin CO_2 emission factor in year y
Source of data	The most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, issued on Mar 2020.
Value(s) applied	0.8795
Choice of data or Measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0.0" as 3-year generation weighted average using data for the years. The data are obtained the most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, dated Mar 2020
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire first crediting period as stated, therefore value is provided above.

Data/Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2/MWh
Description	Build Margin CO2 emission factor in year y
Source of data	The most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, issued on Mar 2020.
Value(s) applied	0.9465
Choice of data or Measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0.0". The data are obtained the most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, dated Mar 2020.
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire first crediting period as stated, therefore value is provided above.

Data/Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined Margin CO2 emission factor in year y

Source of data	The most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, issued on Mar 2020.
Value(s) applied	0.89625
Choice of data or Measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0.0". The data are obtained the most updated Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment, dated Mar 2020.
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire crediting period.

For CPAs which displaces fossil fuel fired on-site captive electricity

Data/Parameter	$EF_{diesel\ generators}$
Data unit	Kg CO_{2e}/KWh converted to tCO_2/MWh
Description	Emission factors for diesel generator systems
Source of data	Table 2 of AMS-I.F Version 03
Value(s) applied	Please refer to Table 2 of AMS-I.F Version 03
Choice of data or Measurement methods and procedures	Default values as per Table 2 of AMS I.F Version 03
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire crediting period.

For CPAs which displaces captive electricity generation

Data/Parameter	$EF_{captive}$
Data unit	tCO_2/MWh
Description	Emission factors for captive electricity generation (with grid electricity consumption, as per footnote 1 of AMS-I.F)
Source of data	Scenario C, case C.III of the tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" version 3.0 was selected because users of captive electricity generation are also connected to the grid (as per footnote 1 of AMS-I.F ver 3.0)
Value(s) applied	0.4
Choice of data or Measurement methods and procedures	Scenario C, case C.III of the tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" version 3.0 was selected because users of captive electricity generation are also connected to the grid (as per footnote 1 of AMS-I.F ver 3.0) In this case C.III, it is stated by the tool that the more conservative emission factor between Scenario A (grid consumption, where emission factor is 0.89625 tCO2/MWh) and Scenario B Option B2(b) (captive power plant emission factor of 0.4 tCO2/MWh) must be chosen. As such, the more conservative value of 0.4 tCO2/MWh is chosen as the emission factor here
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire crediting period.

I.6.3. Modalities for ex ante calculation of emission reductions

>>
Thus, as per equation 9 of AMS I.F Version 3

$$ER_y = BE_y - PE_y - LE_y$$

Where,
ERy = Emission Reduction in year (tCO2e/year)
BEy = Baseline emissions in year (tCO2e/year)
PEy = Project emissions in year (tCO2e)
LEy = Leakage emissions in year y (tCO2e)

Baseline Emission (BE_Y)

The baseline emissions are the product of electrical energy baseline $EG_{facility,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by an emission factor.

$$BE_Y = EG_{facility,y} * EF_{grid,CM,y}$$

Where,
$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

CPA Investor's Name	Capacity	PLF (%)	Generated Power (MWh) p.a	Baseline Emission Factor (tCO2/MWh)	Baseline emissions (tCO2/ year)

$EF_{grid,CM,y}$ = Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO2/MWh).

$BE_y = EG_{BLy} \times EF_{CO2,y}$
Where
- BE_y = Baseline emissions in year y (t CO2)
- EG_{Bly} = Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year y (MWh)
- $EF_{CO2,y}$ = Emission factor (t CO2/MWh)

BE_y = xxxx * xxxx = xxxx

As per Section I.6.1:
$PE_y = 0$
$LE_y = 0$

Thus,
$ER_y = BE_y - PE_y - LE_y$
$ER_y = BE_y - 0 - 0$
$ER_y = BE_y$

Therefore,
ER_y = **xxxx**

I.7. Monitoring plan

I.7.1. Data and parameters to be monitored

Data/Parameter	$EG_{BL,y}$
Data unit	MWh
Description	Quantity of net electricity displaced in year y (MWh/yr)
Source of data	Credit Report /JMR as per Monthly Generation Report
Value(s) applied	XXX (Actual monitored Value from electricity sold invoice, specific to CPA)
Measurement methods and procedures	Data Type: Measured and Calculated Monitoring equipment: Electronic Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: One in two years The net Electricity displaced is measured in kWh. However for the calculation purpose it is converted in MWh. Cross Checking: In the case of electricity sold to a third party, measurement results shall be cross-checked with records of sold/purchased electricity (e.g. invoices/receipts).
Monitoring frequency	Monthly
QA/QC procedures	The calibration of all the meters will be undertaken at required intervals and faulty meters will be duly replaced immediately. The meters will be of accuracy class 0.2s or 0.5s. The meter accuracy class and calibration interval are under purview of the respective country's group energy/electricity regulatory board and CME/CPA owner do not have any control on it. It is also noted that apportioning procedure (if applicable for CPA) is under control of the respective country's group energy/electricity regulatory board and PP do not have any control on it. The available parameter to CME/CPA owner is the net electricity supplied to grid and same parameter is mentioned as monitoring parameter. Wherever possible, the net electricity supplied to grid can be compared with project site meters (controller meter) data.
Purpose of data	The Data/Parameter is required to calculate the baseline emission
Additional comment	Data will be archived electronically for a period of 2 years beyond the end of crediting period.

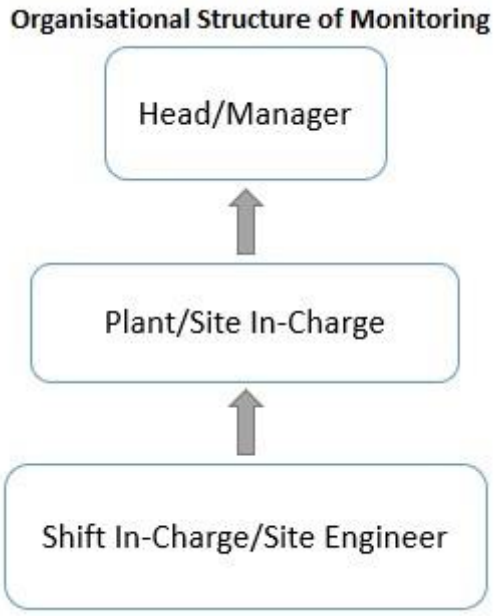
I.7.2. Sampling plan

>>
N/A

I.7.3. Other elements of monitoring plan

>>
The monitoring plan is developed in accordance with the modalities and procedures for CDM project activities and is proposed for grid-connected renewable energy power project (Solar PV) being implemented within the boundary of Vietnam. The monitoring plan, which will be implemented by the CME describes about the monitoring organisation, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage and archiving.

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data results with the CME. CME proposed the following structure for data monitoring, collection, data archiving and calibration of equipment for this CPA. The team comprises of the following members:



CME has assigned the responsibility of operation and maintenance of CPA with relevant and authorised O&M contractors. The Plant In-charge and Shift In-Charge would be deployed by O&M contractors.

Organizational Structure for monitoring:

Designation	Responsibilities
Head / Manager	• Overall functioning and maintenance of the CME • Holds complete control over monitoring aspects pertaining to the project
Plant / Site In-Charge	Maintains the data records, reliability of data (calibration of equipment) and ensures completeness of data such as: • Recording • Verification • Storage of Data
Shift In-Charge / Site Engineer	Responsible for day to day maintenance of: • Data collection • Log book for monitored data • Storage of Data

The CPA having dedicated metering which directly measures quantity of net electricity supplied and same is considered for ER calculations. For CPA having common metering, the apportioning procedure will be followed as mentioned below to determine the parameter net electricity supplied to grid.

For CPAs which involves apportioning procedure due to common metering arrangement for solar projects:

In case of common metering arrangement, the CPA have monitoring system at project site/pooling station and at substation.

The metering is carried out at the substation via a common meter for a group of solar PV projects that is inclusive of the project activity and other than project activity.

The primary monitoring is done through a main meter which is located at the substation. Also, each project activity measures electricity at project site/pooling station.

Only the final apportioned electricity export and import for each project would be reported by national electricity board or by O&M service providers and endorsed by national electricity board in the JMRs. JMRs are taken at the substation level by the local electricity utility. Against the net electricity generation invoices are raised.

O&M service providers maintain all the individual project activity readings at projects site. After recording the Joint Meter values every month, in presence of the National Electricity Board personnel, O&M contractor apportions the generation values for each of the project activity accordingly (based on the project site/pooling station electricity data).

The apportioning of electricity export and import for each project activity is derived from project site/pooling station data. The net electricity generation from each project activity is determined as follows:

$EG_{PJ,y} = EG_{project\ site\ CPA}$ X Total ($EG_{export} - EG_{import}$) / $EG_{project\ site,\ total}$

Where,

$EG_{PJ.y}$ = Quantity of net electricity supplied to the grid from the CPA

Total (EG_{export} - EG_{import}) = Total net export value of all project activity connected to substation

$EG_{project\ site\ CPA}$ = electricity generation at project site/pooling station by CPA

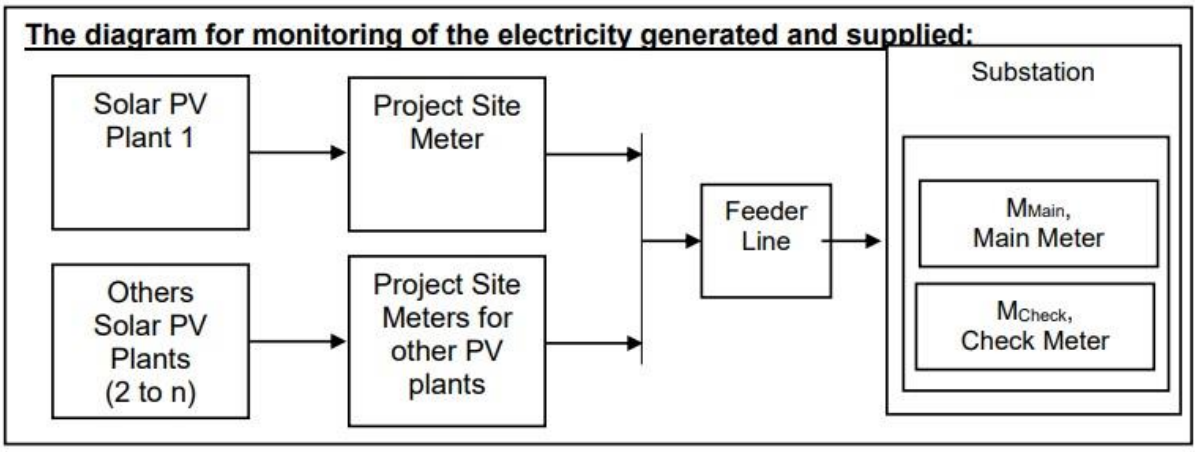
EG_{import} = Total import at sub station

EG_{export} = Total export at sub station

$EG_{project\ site,}$ total = Total electricity generation at project site/pooling station of all project activities which are connected to sub station

In general, for apportioning the common meter export/import reading at substation and ratio of respective project activity reading to all power plants (inclusive of project activity and other than project activity) reading will be used.

The schematic representation of common metering is represented as below:



In case of dedicated metering, CPA will have dedicated meters and there is no common metering involved.

The export and import of respective CPA can be determined separately by using above formula with consideration of only export or import of substation as applicable.

The above apportioning procedure (in case of common metering) will be according to Vietnam's regulations and may not be within the control of the CPA Owner or CPA Implementer. The above

procedure involves two stage metering (controller/project site meter data and substation meter data). Net electricity supplied to grid will be calculated accordingly.

Since there is variation in apportioning procedure from country to country, specific CPA will mention such apportioning procedure (if applicable) based on location of CPA.

QA & QC Procedures to be followed

Necessary check meters as required would be installed, to operate in standby mode or when the main meters are not working. All meters will be calibrated at least once in two year as per CPA notification. Records of calibration certificates will be maintained for verification. Hence, high quality is ensured with the above parameters. The calibration of meters is under purview of national electricity board and CME/CPA owner do not have any control on it.

Data Recording and Storage

For measuring the net energy supplied to grid by the CPA at the interconnection point, one set of Main meter and Check Meter shall be provided. Representatives of both CME/CPA Owner and National Utility will be present to record the monthly meter readings. The National utility will prepare the credit report for the net energy supplied to the grid and same will be used as a basic document for monitoring and verification of the net energy supplied to the grid. Based on the monthly credit report, the CME/CPA Owner shall raise an invoice to the utility. Utility will pay to the CME/CPA Owner based on this document. The above document will be kept at safe storage for verification of emission reductions generated from the project activity. The period of data storage will be 2 years beyond crediting period.

Emergency preparedness

The project activity will not result in any unidentified activity that can result in substantial emissions from the project activity. However, in case monitoring equipment get failed or found faulty, they shall be replaced with calibrated meters as quickly as possible. In case main meter get failed or found faulty, the reading of check meter will be considered.

Personnel training

In order to ensure a proper functioning of the CPA and a properly monitoring of emission reductions, the staff will be trained. The Shift In-charge and Plant In-charge will be trained in equipment operation, data recording, operation and maintenance and emergency procedures in compliance with the monitoring plant.

SECTION J. Crediting period type and duration

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7 years and renewable 3 times equating to 21 years or 252 months.

SECTION K. Eligibility criteria for inclusion of CPAs

>>

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion

1	Geographical boundaries of CPAs consistent with the geographical boundary of the PoA;	The geographical boundary of the CPA area is uniquely defined and within the boundary of Vietnam.	• Feasibility study report or • Third party PLF assessment report or • Land documents, or • Commissioning certificates, or • Permission from regulatory authorities or • Relevant equivalent document
2	Conditions to avoid double counting of GHG emission reductions or net anthropogenic GHG removals	The CPA must not be part of any other PoA or will not be registered as individual CPA under any other emission reduction scheme or programme, or deregistered CDM project activity	• Inclusion Contract • and cross-checked on UNFCCC website by CME • CPA implementer confirmation
3	Conditions to confirm that CPAs are neither registered as CDM project activities, included in another registered PoAs, nor the project activities that have been deregistered;	The CPA must not be part of any other PoA or will not be registered as individual CPA under any other emission reduction scheme or programme, or deregistered CDM project activity	• Inclusion contract • Cross-check on UNFCCC project cycle • CPA implementer confirmation

4	Specification of the technology/measure	Technology for solar PV array use for CPAs consisting of either: - Monocrystalline Solar Panels (Mono-SI) - Polycrystalline Solar Panels (p-Si) - Thin-Film: Amorphous Silicon Solar Panels (A-SI) - Concentrated PV Cell (CVP) The Solar PV system will include: -Mounting structures (potentially also including tracking system) -Junction box, distribution boxes and DC (direct current) cabling connecting modules with inverters -Inverters -Production meter on AC (alternating current) inverter output side (integrated to inverter) -Data logger and/or gateway to internet (potentially integrated to inverter) -Transformers -Circuit breakers -System for control and monitoring -Grid utility meter Evacuation system / grid connection system The capacity range of Case 5's entire system will be ≤ 5 MW. Electricity produced by the project activity will be monitored at the point it is exported to the grid. The technology shall have Approval / certification from the relevant designated authority. All the equipment of each CPA will be complying with applicable national/ international standards.	• Inclusion contract • Feasibility study report or • Offer from the party providing the equipment / construction / operation services proving that the CPA is greenfield CPA. • Power Purchase Agreement / Wheeling Agreement or the Approval from the relevant local authority or • Purchase Orders /Work Order / contract with party Providing equipment / construction /operation services. • CPA-DD

5	Conditions to check the start dates of CPAs;	The CPA only started after the start date of the PoA. The start date of the PoA is considered as **24/07/2018** which is the intimation of prior CDM consideration to UNFCCC & the relevant country's' DNAs. Therefore, start date of the CPA must be later than 24/07/2018	• Purchase orders/contracts for equipment or construction/operation services or any other documents as stated in the Glossary of CDM terms
6	Conditions to ensure compliance with the applicability of the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents;	Project Activity will compromise of only AMS I.F, where it will: 1. Be an installation of a Greenfield Plant 2. Have a plant capacity of ≤5MW 3. Only consist of Solar PV technology 4. Users would have been supplied electricity from one or more sources listed below: (a) A national or a regional grid (grid hereafter); (b) Fossil fuel fired captive power plant. Users of such captive electricity will also be connected to the grid in the project site, as per footnote 1 of AMS-I.F ver 3.0 (c) A carbon intensive mini-grid. 5. At least one fossil-fuel fired generation source 6. Project classified as "generator" 7. PV generation monitored by grid meter, and data transmitted to CME	• Inclusion contract • Feasibility study report or • Offer from the party providing the equipment / construction / operation services proving that the CPA is greenfield CPA. • The source of electricity to the user can be verified through Power Purchase Agreement / Wheeling Agreement or the • Approval from the relevant local authority or Purchase Orders /Work Order / contract with party providing equipment / construction /operation services. • CPA-DD will be provided. CPA-DD will be checked/used for identification of relevant baseline scenario as per the methodology and ensure that users should not be supplied with renewable electricity in the baseline scenario.

7	Condition to ensure the CPA meet the requirement for demonstration of additionality.	Micro scale CPAs shall be photovoltaic project and shall be automatically additional as per positive list stated in the tool 'Demonstration of additionality of small-scale project activities' version 13.0, para 11. Installed capacity to be confirmed by Inclusion Contract and documentary evidence; CME carries out further plausibility checks based on monitoring data	• Inclusion contract • Detailed Project Report prepared by third party • CPA-DD • Feasibility report
8	Conditions related to undertaking local stakeholder consultation and environmental impact analysis;	The CPA shall conduct a local stakeholder consultation and environmental impact assessment according to local regulation. This will be reviewed by CME at CPA level	• Inclusion contract • Environmental impact assessment report • Environmental impact assessment approval • Minutes of meeting of local stakeholder consultation, • attendance records, invitation letters etc.
9	Conditions to provide an affirmation that funding from Annex I Parties, if any, does not result in a diversion of official development assistance;	The CPA shall not involve funding from Annex I parties that results in a diversion of official development assistance.	• Undertaking from CPA Owner or CPA Implementer.
10	Target group (e.g. domestic/commercial/industrial, rural/urban, grid-connected/off grid), and where applicable, distribution mechanisms (e.g. direct installation);	The CPA supplies electricity to the national/regional grid or uses national grid for captive or third-party sale	• Power Purchase Agreement • Grid Evacuation approval/agreement • Wheeling Agreement, or • DPR or CPA
11	CPA remain within SSC threshold	Each CPA will have a maximum capacity of 5MW per year throughout the CPA's crediting period	• Inclusion contract • CPA-DD
12	Condition of de-bundling check	Small-scale CPA is not de-bundled part or larger activity CPA owner confirms by Inclusion Contract that within the previous 2 years no other of his PV plants located in a distance of less than 1 km has been registered as CDM project or included as CDM CPA to a PoA	• Inclusion contract • Undertaking from CPA Owner or CPA Implementer.

Appendix 1. Contact information of coordinating/managing entity and project participants

Coordinating/managing entity and/or project participants	☒ Coordinating/managing entity ☐ Project participant
Organization name	Climate Resources Exchange International Pte Ltd
Country	Singapore
Address	20 Malacca Street #07-00 Malacca Centre (S) 048979
Telephone	+65 6922 9881
Fax	-
E-mail	Cherie.sim@climate-resources.com, v.kesava@climate-resources.com
Website	www.climateresources.net
Contact person	Cherie Sim, Vinod Kesava

Appendix 2. Affirmation regarding public funding

Neither public funding nor ODA funding was applied for by the project proponent.

Appendix 3. Applicability of methodologies and standardized baselines

Please refer to Section I.2

Appendix 4. Further background information on ex ante calculation of emission reductions

Addressed in CPA-DD

Appendix 5. Further background information on monitoring plan

N/A

Appendix 6. Summary report of comments received from local stakeholders

Addressed in CPA-DD

Appendix 7. Summary of post-registration changes

The section is left blank intentionally

Document information

Version	*Date*	*Description*
09.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for programmes of activities" (CDM-EB93-A07-STAN); • Make editorial improvements.
08.1	28 June 2017	Revision to: • Remove a duplicated instruction; • Make editorial improvement.
08.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for programmes of activities" and with the PDD and CPA-DD forms; • Make editorial improvement.
07.0	25 May 2017	Revision to: • Ensure consistency with the "CDM project standard for programmes of activities" (CDM-EB93-A07-STAN) (version 01.0); • Incorporate the "Programme design document form for small-scale CDM programmes of activities" (CDM-SSC-PoA-DD-FORM); • Make editorial improvement.
06.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
05.0	9 March 2015	Revision to: • Include provisions related to choice of start date of PoA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Add exception for generic CPA where technology is under positive lists; • Make editorial improvement.
04.1	5 August 2014	Editorial revision to correct the document information table.

Version	*Date*	*Description*
04.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM programme of activities (these instructions supersede the Guideline: Completing the programme design document form for CDM programme of activities (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the PoA in B.4 and Appendix 1; • Add general instructions on post-registration changes in paragraphs 2 and 3 of general instructions and Appendix 6; • Change the reference number from F-CDM-PoA-DD to CDM-PoA-DD-FORM; • Make editorial improvement.
03.0	3 December 2012	EB 70 Revision to reflect changes to the *Guideline: Completing the programme design document form for CDM programmes of activities* (EB 70, Annex 6).
02.0	13 March 2012	EB 66 Revision required to ensure consistency with the "Guidelines for completing the programme design document form for CDM programmes of activities" (EB 66, annex 12).
01.0	27 July 2007	EB 33, Annex 41 Initial publication.

Decision Class: Regulatory
Document Type: Form
Business Function: Registration
Keywords: programme of activities, project design document