CLEAN DEVELOPMENT MECHANISM
SMALL-SCALE PROGRAMME OF ACTIVITIES DESIGN DOCUMENT FORM
(CDM-SSC-PoA-DD) Version 01

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NOTE:

(i) This form is for the submission of a CDM PoA whose CPAs apply a small scale approved methodology.

(ii) At the time of requesting registration this form must be accompanied by a CDM-SSC-CPA-DD form that has been specified for the proposed PoA, as well as by one completed CDM-SSC-CPA-DD (using a real case).

SECTION A. General description of small-scale programme of activities (PoA)

A.1 Title of the small-scale programme of activities (PoA):

GRT Energy Small Scale Solar PV (PoA)
Version 4.0Date: 06/07/2012

A.2. Description of the small-scale programme of activities (PoA):

1. *General operating and implementing framework of PoA*

The GRT Energy Small Scale Solar PV (PoA) is a programme to promote the implementation of small-scale, solar photo-voltaic (PV) grid connected power plants in Thailand.

The proposed PoA will be operated and implemented by four key parties, each with defined roles and responsibilities:

1. The Coordinating and Managing Entity (CME) - *GRT Energy Co., Ltd*, (GRT);
2. CER Buyer - *Tricorona Carbon Assessment Management Pte Ltd*;
3. CDM Consultant *Biosphere Capital Pte Ltd*;
4. CPA Owners (project developers).

The CME will have a contract with each CPA owner and the CPA owners will officially ascribe the CERs generated from their project(s) to the CME. The CERs will subsequently be ascribed/ sold to the CER Buyer via an ERPA.

The CME and the CER Buyer will have a Joint Focal Points authority for the PoA.

2. *Policy/measure or stated goal of the PoA*

The stated goal of the PoA is to develop a platform which will assist the development of small-scale grid connected solar PV power plants in Thailand, thereby displacing carbon-intensive electricity from the grid and reducing associated Greenhouse Gas (GHG) emissions. The PoA will assist the small-scale solar PV projects by overcoming the financial hurdles faced by the development of such projects in Thailand.

3. *Confirmation that the proposed PoA is a voluntary action by the coordinating/managing entity.*

The proposed PoA is a voluntary action by the CME. Each CDM programme activity is implemented voluntarily by project developers; the development of the project activities is not required or mandated by Thai law.[1]

A.3. Coordinating/managing entity andparticipants of SSC-POA:

Table 1: Project participants

Name of the Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)

[1] According to the Renewable Energy Development Plan for the Period 2008 to 2022, the Royal Thai Government supports the use of renewable energy in the country without legally binding regulations that would enforce the implementation of such projectsSD_43-ThaiRenewableEnPolicies; http://www.dede.go.th/dede/images/stories/english/information/ThaiRenewableEnPolicies.pdf; SD_43

Sweden	Tricorona Carbon Asset Management Pte Ltd	No
Thailand (host)	Managing Entity: GRT Energy Co.,Ltd.	No
(*)In accordance with the CDM Modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party (ies) involved as required.		

A.4. Technical description of the small-scale programme of activities:

A.4.1. Location of the programme of activities:

The PoA is located at separate sites across Thailand.

A.4.1.1. Host Party(ies):

Thailand

A.4.1.2. Physical/ Geographical boundary:

The geographical boundary of the PoA is Thailand.

Figure 1:Geographical boundary of PoA-Thailand

A.4.2. Description of a typical small-scale CDM programme activity (CPA):

A.4.2.1. Technology or measures to be employed by the SSC-CPA:

A typical CPA under the current PoA comprises of either a single project activity or a bundle of project activities. The project activity would be newly-built Solar PV power plants with a maximum installed capacity up to 15 MW per CPA, including capacity expansions at existing facilities. Such plants shall be

constructed by one or more third-party project owners and generate electricity from solar resources. The electricity generated will be supplied to the national Thailand electricity grid.

Solar PV power plants will generate electricity by converting solar radiation into direct current electricity using semiconductors that exhibit photovoltaic effects. CPAs will consist of an array of solar panels or PV modules (composed of a number of cells containing photovoltaic material) as well as mechanical and electrical connections and means of regulating and/or modifying the electrical output, in order to be able to export electricity to the national grid. Sending electricity to the grid requires transformation of DC into AC by an inverter which will be connected to the grid at the sub-station and shall not exceed the installed capacity of 15 MW.

The solar panels will typically, but not necessarily, be installed on the ground (either on rented or owned space) and connected to the grid. Some of the installations may be installed on the rooftops (either on rented or owned space) and connected to the grid.

For a typical solar panel specifications refer to supporting document-SD_2- Sharp_panel_brochure and SD_3-Inverter_Specification-Emerson.

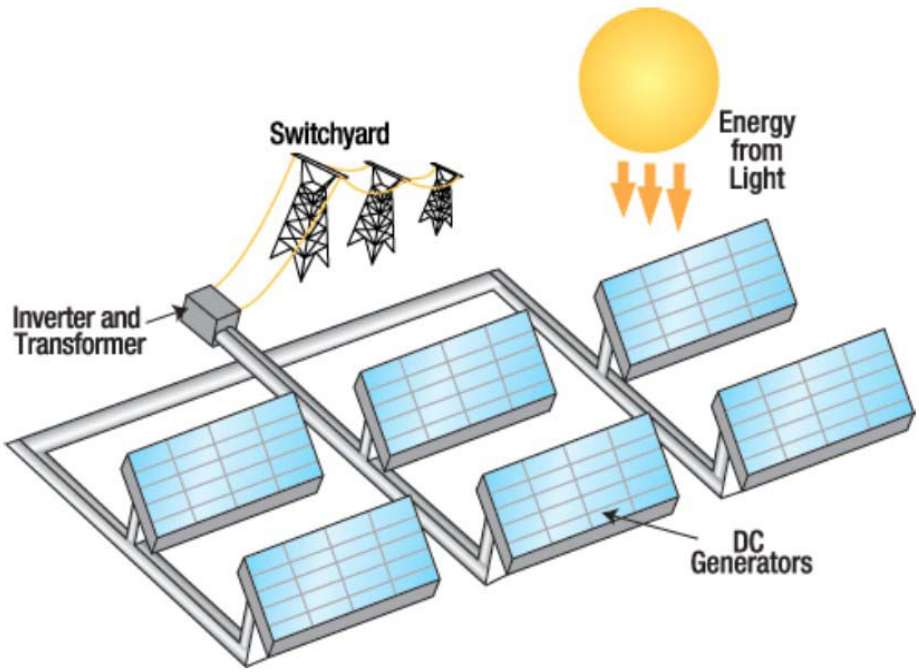

Figure 2: Schematic diagram of a typical SSC-CPA

Table 2: Technical specifications for a typical SSC-CPA

S.No	Category	Specification
1	Description of different Solar PV technologies employed in the current PoA	• Crystalline technology for Solar PV module OR • Thin film technology for Solar PV modules

S.No	Category	Specification
2	Average scale range of an installation(CPA)	1-15 MW
3	Typical design of a facility	Refer to Figure 2 above
4	Connection to the grid and equipments required	A Switch Gear will be used to connect the CPA with the transmission line, which would further connect it to the grid through a nearby substation and a corresponding distribution line.
5	Performance ratio	Around 80%
6	Yearly operational hours	Around 1400 hrs/year (effective, daylight)
7	Plant Load Factor	15-18%
8	Land requirements per MW	16,000 – 32,000 sq.m
9	Timeline for implementation	1. Preparation : 120-180 days[2] 2. Construction : 60-90 days 3. Inspection : 15 days 4. Inspection and Test: 60 days 5. Operation : 90 days
10	Equipment lifetime (assessment period)	25 years

A.4.2.2. Eligibility criteria for inclusion of a SSC-CPA in the PoA:

The following technical criteria must be met by each SSC-CPA, in order to be eligible to be included into the PoA.

Table 3: Eligibility criteria for the inclusion of the CPA in the PoA

S.No	Eligibility Criteria for the inclusion of CPAs	Status (Yes/No)	Suggested Evidence/Supporting documents
a	The SSC-CPA should have its project site located in Thailand and the electricity generated shall be fed to the Thai National Grid.	[Yes/No]	Power purchase agreements (PPA)
b	The SSC-CPA shall be uniquely identified and defined by way of the unique identifying numbers (serial numbers) and GPS coordinates attached to each Solar PV installation, to ensure that all CPAs under this PoA are neither registered as an individual CDM project activity nor included in another registered PoA.	[Yes/No]	Feasibility Study Report / site GPS coordinates
c	The SSC-CPA shall generate electricity using solar photo-voltaic (PV) technology (including but not limited to thin film and crystalline technology). The technology should comply with national regulatory standards of Thailand[3].	[Yes/No]	Feasibility Study Report (FSR)/ Panel specification sheet/ Project technical design documentation

[2] SD_4-5MW_Lopburi_-_Feasibility_Report_English_version-2011, Page-19

[3] SD_24-INTERCONNECTIONCODE_PEA_EN[1], para-5, page-6

S.No	Eligibility Criteria for the inclusion of CPAs	Status (Yes/No)	Suggested Evidence/Supporting documents
d	Confirmation that the start date of a CPA is not, or will not be, prior to the commencement of validation of the programme of activities, i.e. the date on which the CDM-POA-DD is first published for global stakeholder consultation.	[Yes/No]	EPC contract or panel supply contract will be used as evidence of starting date of a CPA. Only CPAs for which the EPC contract or panel supply contract is signed after 25th January 2012 can be included in the PoA.
e	The SSC-CPA shall comply with the applicability criteria of the methodology *AMS.I.D- Grid connected renewable electricity generation, version - 17.0.* The SSC-CPA shall comply with each of the criterion below, as applicable: • Shall not be a combined heat and power (co-generation) system; • Capacity limits: the CPA in aggregate shall not exceed 15MW installed capacity. This applies for Greenfield as well as capacity addition projects. o For CPAs that are greenfield projects, the installed capacity of the CPA shall not exceed 15 MW throughout the CPA's crediting period o For CPAs that involve capacity additions, the added capacity of the units in the CPA shall not exceed 15 MW throughout the CPA's crediting period and should be physically distinct[4] from the existing units.	[Yes/No]	FSR and EPC/panel supply contract/purchase order specifying the installed capacity and confirming that the proposed project is not a combined heat and power project.
f	The SSC-CPA should comply with the requirements stated in the generic CPA-DD for the following: • Stakeholder consultation • Assessment of environmental impacts if any and as required by national regulations	[Yes/No]	For Stakeholder consultation: Minutes of the meeting; For Environmental Impacts: GPS coordinates of the CPA site location cross-checked against the list of designated watershed protected areas[5]; Land Title Deed;

[4] Physically distinct units are those that are capable of generating electricity without the operation of existing units, and that do not directly affect the mechanical, thermal, or electrical characteristics of the existing facility. For example, the addition of a steam turbine to an existing combustion turbine to create a combined cycle unit would not be considered "physically distinct".

[5] SD_38-watershed-list and SD_42-watershed-area-map

S.No	Eligibility Criteria for the inclusion of CPAs	Status (Yes/No)	Suggested Evidence/Supporting documents
			Environmental Impact Assessment Report or equivalent if required by national regulations.
g	The SSC-CPA shall undergo a de-bundling check as follows: A proposed small-scale CPA of a PoA shall be deemed to be a de-bundled component of a large scale activity if there is already an activity which satisfies both conditions (a) and (b) below: 1. Has the same activity implementer as the proposed small scale CPA or has a coordinating managing entity, which also manages a large scale PoA of the same technology/measure, and; 2. The boundary is within 1 km of the boundary of the proposed small-scale CPA, at the closest point. However, if the total size of such a CPA combined with a registered small-scale CPA of a PoA does not exceed an installed capacity of 15MW, then the proposed SSC CPA is not considered to be a debundled component of a large-scale activity.	[Yes/No]	CPA-CME contract confirming that SSC-CPA is not a debundled component of any other large scale project activity; check against Thai Solar Database
h	Conditions to provide an affirmation that funding from Annex I parties, if any, do not result in a diversion of official development assistance.	[Yes/No]	CPA-CME contract confirming that no ODA has been diverted
i	All the SSC-CPA owners shall formally/legally own the land/ rooftops, on which the SSC-CPA is going to be installed, or rent the land/ rooftops from the legal owners	[Yes/No]	Land or rooftop lease/ownership agreements
j	The SSC-CPA owners shall have a business license or should have been legally registered to conduct business in Thailand.	[Yes/No]	Company business license
k	Contractual provisions should be in place to ensure that those operating the CPA are aware of, and have agreed, that their activity is being subscribed to the PoA.	[Yes/No]	CPA-CME contract
l	Project activities that involve the transfer of equipment such as panels or inverters from other existing operational projects shall not be eligible for inclusion in this PoA.	[Yes/No]	Statement in the CPA-CME contract

A.4.3. Description of how the anthropogenic emissions of GHG by sources are reduced by a SSC-CPA below those that would have occurred in the absence of the registered PoA (assessment and demonstration of additionality):

1. *The proposed PoA is a voluntary coordinated action;*

The POA is being developed by GRT Energy Co., Ltd in coordination and collaboration with Solar PV project developers. The development of solar PV projects in Thailand is not mandated or required by law and project developers are free to choose the technology to be deployed. The POA is a voluntary coordinated action.

2. *If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA;*

The Project Proponent has chosen to demonstrate additionality at the POA level, with only demonstration of compliance with the specified "additionality criteria" required by each CPA. In line with the EB Guidance "Attachment A to Appendix B" of the "Simplified modalities and procedures for small-scale CDM project activities (EB63, Annex 24), solar power projects with the installed capacity up to 15 MW are considered to be additional without the need for further demonstration.

Thus, a SSC-CPA is automatically additional if it meets the eligibility criteria for the inclusion of the CPA in the PoA, as per section A.4.2.2 of this PoA-DD.

A.4.4. Operational, management and monitoring plan for the programme of activities (PoA):

A.4.4.1. Operational and management plan:

In line with EB 63, Annex 3, Para 9(a) to 9 (g) the PoA will be managed in the following way:

Table 4: PoA-management system

S.No	Requirement	Compliance
1	Clear definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies made available to the DOE at the time of validation of the PoA;	GRT Energy Co., Ltd (GRT) will be the CME, Biosphere Capital will be the CDM consultant and Tricorona Carbon Asset Management (Tricorona) will be the CER buyer. Their roles and responsibilities are explained in detailed in SD_5-GRT_POA MANAGEMENT SYSTEM THAILAND_02APR2011 , Page 3, Para 1.2.
2	Records of arrangements for training and capacity development for personnel made available to the DOE at the time of validation of the PoA;	There will be two types of training conducted for the PoA, for two different purposes, namely: PoA level and CPA level training. Capacity development will include opportunities like industry events, workshops etc. It is further elaborated in SD_5-GRT_POA MANAGEMENT SYSTEM THAILAND_02APR2011,page

		7, Para 2
3	Procedures for technical review of inclusion of CPAs made available to the DOE at the time of validation of the PoA;	A procedure for technical review of inclusion of CPAs involves three steps, namely: 1) Data collection, 2) Data analysis, 3) Outcome. These steps are further elaborated in SD_5-GRT_POA MANAGEMENT SYSTEM THAILAND_02APR2011, page 9, para-4
4	A procedure to avoid double counting (e.g. to avoid the case of including a new CPA that has already been registered either as a CDM project activity or as a CPA of another PoA);	The CME will create a "Thai Solar database", which will include the name, size/scale, owner, location, commissioning and CDM status of all grid-connected solar projects in Thailand. The Thai Solar database will be cross checked against the CDM database and the PEA database for the Very small power producers (VSPPs). This is further elaborated in SD_5-GRT_POA MANAGEMENT SYSTEM THAILAND_02APR2011, page-11, para-5.
5	Records and documentation control process for each CPA under the PoA, made available to the DOE at the time of request for inclusion of the CPA;	The CPA details, Monitoring data and CER issuance data will be archived for a period of two years after the expiration of the PoA crediting period. The documentation control process is further explained in SD_5-GRT_POA MANAGEMENT SYSTEM THAILAND_02APR2011, page 12, para-8.
6	Measures for continual improvements of the PoA management made available to the DOE at the time of validation of the PoA	Continual improvements will be done by checking monitored data, using complaints/queries register etc. It is further elaborated in SD_5-GRT_POA MANAGEMENT SYSTEM THAILAND_02APR2011, Page14, para-9.
7	Any other relevant elements	N/A

(i) <u>A record keeping system for each CPA under the PoA,</u>

A database (hereafter referred to as "Thai Solar" database) will be set up by the technical team of GRT-Energy for the PoA. It will include the following information for each solar PV installation in a SSC-CPA, under the current PoA:

- Name of its owner
- Location of the installation (geographic coordinates)
- Installation date
- Supplier and type
- Serial number (CPA-XXX format)
- Scale (MW capacity)
- Contractual arrangements clearly ascribing the CERs generated by the CPA to the CME
- Name of the CPA to which the installation is included

(ii) A system/procedure to avoid double accounting e.g. to avoid the case of including a new CPA that has been already registered either as a CDM project activity or as a CPA of another PoA,

Thai-Solar database ensures that all CPAs are uniquely identified by a serial number (CPA-XXX format) and are included under one PoA only once, thereby avoiding double counting of emissions reductions generated by the CPA.

(iii) The SSC-CPA included in the PoA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity.

The CME will check each new CPA against the de-bundling rules before including it into the PoA. The CME will sign a CPA/CME Agreement with each CPA owner, which will include affirmation by the CPA owners that they meet the debundling criteria of the *Guidance For Determining The Occurrence Of De-bundling Under A Programme Of Activities (PoA)" (*EB 54, Annex 13), i.e. that:

1. *There is no activity*[6] *yet which:*
   - ***(a)*** *Has the same activity implementer as the proposed small scale CPA or has a coordinating or managing entity, which also manages a large scale PoA of the same sectoral scope, and;*
   - ***(b)*** *Has the boundary within 1 km of the boundary of the proposed small-scale CPA, at the closest point.*

2. *If a proposed small-scale CPA of a PoA is deemed to be a debundled component in accordance with paragraph 1 above, but the total size of such a CPA combined with a registered small-scale CPA of a PoA or a registered CDM project activity does not exceed the limits for small-scale CDM project activity (15 MW), this CPA can qualify to use simplified modalities and procedures for small-scale CDM project activities.*

(iv) The provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being ascribed to the PoA;

The CME will sign a CPA/CME Agreement with each CPA owner, which will include the agreement of the CPA owners to ascribe the CERs generated by their CPAs to the CME.

A.4.4.2. Monitoring plan:

In the proposed PoA, *Option (ii)* is chosen i.e. CME opts for a verification method that does not use sampling but verifies each SSC-CPA.

For each CPA all parameters included in section E.7.1 will be monitored according to the monitoring plan set in section E.7.2. The data will given by the CPA operator to the CME, who would be responsible for storing the data. Each CPA and each CPA's data are uniquely identified by a unique Serial Number and geographic coordinates of the site (as explained above).

The CME will record the verification status of each CPA, ensuring no double counting occurs.

[6] Which may be a (i) registered small-scale CPA of a PoA, (ii) an application to register another small-scale CPA of a PoA or (iii) another registered CDM project activity

A.4.5. Public funding of the programme of activities (PoA):

Each CPA-DD will include declaration and description of any public funding received by the CPA owner in relation to the development of the CPA.

SECTION B. Duration of the programme of activities (PoA)

B.1. Starting date of the programme of activities (PoA):

PoA Start Date – 25/01/2012 (Webhosted Date)

01/02/2013 (starting date of crediting period)

30/01/2013 (starting date of 1st CPA)

B.2. Length of the programme of activities (PoA):

28 years

SECTION C. Environmental Analysis

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C.1. Please indicate the level at which environmental analysis as per requirements of the CDM modalities and procedures is undertaken. Justify the choice of level at which the environmental analysis is undertaken:

1. Environmental Analysis is done at PoA level ☐
2. Environmental Analysis is done at SSC-CPA level x

Environmental analysis will be done at the SSC-CPA level. This is considered appropriate as the potential environmental impacts of each CPA could differ in relation to the location and setting of each site.

C.2. Documentation on the analysis of the environmental impacts, including transboundary impacts:

Given the nature of small-scale solar PV installations, no significant social or environmental impacts are likely during the construction or operation of the CPAs. Any significant potential impacts for each specific CPA will be addressed at the CPA level.

C.3. Please state whether in accordance with the host Party laws/regulations, an environmental impact assessment is required for a typical CPA, included in the programme of activities (PoA),

Environmental Impact Assessments for small scale solar PV projects are not required in Thailand[7] . An *Environmental and Social Assessment* (ESA) is usually undertaken by such smaller scale projects, though formal approval of the ESA is not required.

According to Section 46 and Section 51 of the National Environment Quality Act (NEQA) in 2535, there are 34 types of projects which are required to perform an Environmental Impact Assessment (EIA) report for office of Natural Resources and Environment's consideration. An approval from the office of natural resources and environment is required for the implementation of the 34 types of projects[8]. In accordance with this list of project types, solar power plant projects do not need to undertake an EIA unless they are located in a designated watershed area (type 34). The designated watershed areas are listed in SD_38-watershed-list or web link: http://water.rid.go.th/hyd/basin/25basin.htm.

If any part of a CPA is included in one of these areas, an EIA is required.

There are no transboundary impacts associated with the potential CPAs in the current PoA.

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7 "PROCEDURE OF ENVIRONMENTAL IMPACT ASSESSMENT IN THAILAND", by Suttipong Pruangka, Mohamed bin Daud, Mohd Zohadie Bardaie and Shamahuddin Jusop, 1998 (SD8)

8 http://www.onep.go.th/eia/index.php?option=com_content&view=article&id=67:2010-10-04-22-39-53&catid=4:2010-09-16-04-32-17&Itemid=10

SECTION D. Stakeholders' comments

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D.1. Please indicate the level at which local stakeholder comments are invited. Justify the choice:

1. Local Stakeholder consultation done at PoA level ☐
2. Local Stakeholder consultation done at CPA level x

Local stakeholder consultation will be done at the CPA level. This is considered appropriate since the stakeholders associated with the different CPAs in Thailand would be different and specific to each CPA, as the CPA locations are different.

D.2. Brief description how comments by local stakeholders have been invited and compiled:

Refer to the Generic CPA-DD and each CPA-DD

D.3. Summary of the comments received:

Refer to CPA-DD

D.4. Report on how due account was taken of any comments received:

Refer to CPA-DD

SECTION E. Application of a baseline and monitoring methodology

E.1. Title and reference of the approved SSC baseline and monitoring methodology applied to a SSC-CPA included in the PoA:

Methodology : AMS I.D
Title : Grid connected renewable energy generation
Version : 17
Meeting Number : EB 61

E.2. Justification of the choice of the methodology and why it is applicable to a SSC-CPA:

Table 5: Methodology Justification

S.No	Applicability criteria	Project eligibility
1	This category comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to a national or a regional grid.	All the CPAs to be included in the current PoA are solar photovoltaic projects that will supply electricity to the national grid.
2	Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A[9]) applies is included in Table 2.	The current PoA aims to promote project activities that supplies electricity to national/regional grid.
3	This methodology is applicable to 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; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement[10] of (an) existing plant(s).	The project activities (CPAs) could include: • A new Solar PV power plant at a site where there are no renewable energy power plants operating prior to the implementation of the project activity (Greenfield plant) • Projects that involve a capacity addition

[9] 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"

[10] Replacement. It involves investment in a new power plant or unit that replaces one or several existing unit(s) at the existing power plant. The installed capacity of the new plant or unit is equal to or higher than the plant or unit that was replaced.

S.No	Applicability criteria	Project eligibility
4	Hydro power plants with reservoirs[11] that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir,[12] 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; • 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.	Only small scale grid connected solar PV projects are eligible, projects using hydro power technology are not eligible or applicable
5	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[13], the capacity of the entire unit shall not exceed the limit of 15 MW.	All the CPAs have only a renewable component as a Solar PV installation.
6	Combined heat and power (co-generation) systems are not eligible under this category.	The project activities under the PoA are not a combined heat and power project.
7	In the case of project activities that involve the 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[14] from the existing units.	For CPAs that involve a capacity addition to (an) existing plant(s), the added capacity of the units added by the project shall not exceed 15MW and will be physically distinct from the existing units
8	In the case of retrofit or replacement, to qualify	The PoA will not include retrofit or

[11] A reservoir is a water body created in valleys to store water generally made by the construction of a dam.

[12] A reservoir is to be considered as an "existing reservoir" if it has been in operation for at least three years before the implementation of the project activity.

[13] A co-fired system uses both fossil and renewable fuels.

[14] Physically distinct units are those that are capable of generating electricity without the operation of existing units, and that do not directly affect the mechanical, thermal, or electrical characteristics of the existing facility. For example, the addition of a steam turbine to an existing combustion turbine to create a combined cycle unit would not be considered "physically distinct".

S.No	Applicability criteria	Project eligibility
	as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	replacement projects

E.3. Description of the sources and gases included in the SSC-CPA boundary

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According to the methodology AMS.I.D, the sources and gases included in the SSC-CPA boundary are to be described according to the most recent version of ACM0002.

Table 6: Major and Minor emission sources

Source		Gas	Included?	Justification / Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project activity	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam	CO_2	No	N.A.
		CH_4	No	N.A.
		N_2O	No	N.A.
	CO_2 emissions from combustion of fossil fuels for electricity generation in geothermal power plants	CO_2	No	N.A.
		CH_4	No	N.A.
		N_2O	No	N.A.
	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	N.A.
		CH_4	No	N.A.
		N_2O	No	N.A.

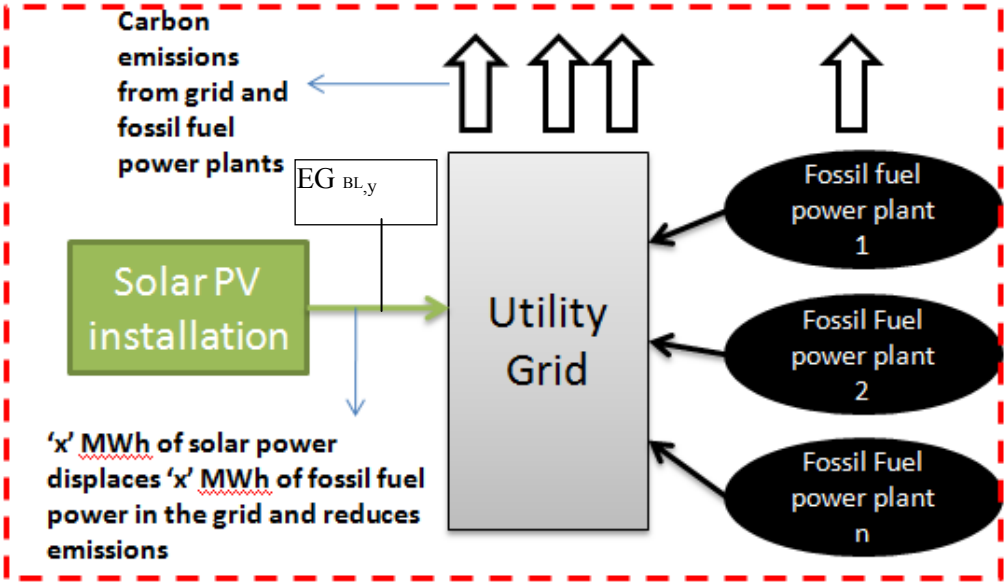

Figure 3: Typical SSC-CPA project boundary

E.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

In line with the methodology, 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 PoA and constituent CPAs will displace electricity from the grid and thus reduce Greenhouse Gas emissions associated with the combustion of fossil fuels for electricity generation. There are no national or sectoral policies (E+/E-) or circumstances affecting the baseline scenario.

E.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the SSC-CPA being included as registered PoA (assessment and demonstration of additionality of SSC-CPA) : >>

E.5.1. Assessment and demonstration of additionality for a typical SSC-CPA:

A typical SSC-CPA for the current PoA will demonstrate additionality based on EB 63, Annex 24, *"Attachment A of appendix B of the "Simplified modalities and procedures for small-scale CDM project activities" "*, version 08, Para 2.

E.5.2. Key criteria and data for assessing additionality of a SSC-CPA:

A SSC-CPA is automatically additional if it meets the eligibility criteria for the inclusion of the CPA in the PoA, as per section A.4.2.2 of this PoA-DD.

E.6. Estimation of Emission reductions of a CPA:

E.6.1. Explanation of methodological choices, provided in the approved baseline and monitoring methodology applied, selected for a typical SSC-CPA:

The CPAs under this PoA will apply the small scale methodology AMS.I.D, "Grid connected renewable electricity generation", version 17

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

The baseline emissions are the product of electrical energy baseline expressed in megawatt hours (MWh) of electricity produced by the renewable generating unit multiplied by the grid emission factor.

The equations used to determine the emission reduction is discussed in E.6.2.

E.6.2. Equations, including fixed parametric values, to be used for calculation of emission reductions of a SSC-CPA:

Baseline Emissions:

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

$$BE_y = EG_{BL,y} * EF_{CO_2,grid,y}$$

Where:

BE_y	Baseline Emissions in year *y* (t CO_2)
$EG_{BL,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{CO2,grid,y}$ CO2 emission factor of the grid in year y (t CO2/MWh)

For capacity addition:

Power generation can vary significantly from year to year, due to natural variations in the availability of solar source, the use of few historical years to establish the baseline electricity generation can therefore involve a significant uncertainty. The methodology AMS.I.D, version 17, EB 61 addresses this uncertainty by adjusting the historical electricity generation by its standard deviation. This ensures that the baseline electricity generation is established in a conservative manner and that the calculated emission reductions are attributable to the project activity. Without this adjustment, the calculated emission reductions could mainly depend on the natural variability observed during the historical period rather than the effects of the project activity.

1. According to AMS.I.D, version 17, EB 61, The baseline emissions for capacity additions($BE_{retrofit,CO_2,y}$) are thus calculated as follows:

$$BE_{retrofit,CO2,y} = [EG_{BL,retrofit,y}] * \mathrm{EF}_{\mathrm{CO2}} \quad \textbf{(1)}$$

Where:

$$EG_{BL,retrofit,y} = \mathrm{EG}_{\mathrm{PJ,\,facility,y}} - (\mathrm{EG}_{\mathrm{historical}} + \sigma_{\mathrm{historical}}) \quad \textbf{(2)}$$

$$EG_{BL,retrofit,y} = 0 \; on/after \; DATE_{BaselineRretrofit} \quad \textbf{(3)}$$

Where:

$EG_{BL,retrofit,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)
$\mathrm{EG}_{\mathrm{PJ,\,facility,y}}$	Quantity of net electricity supplied to the grid by the project plant/unit in year *y* (MWh)
$\mathrm{EG}_{\mathrm{historical}}$	Annual average historical net electricity generation by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity (MWh)

Average of historical net electrical energy levels delivered by the existing facility, spanning all data from the most recent available year (or month, week or other time period) to the time at which the facility was constructed, retrofit, or modified in a manner that significantly affected output (i.e. by 5% or more), shall be used.

To determine $\mathrm{EG}_{\mathrm{historical}}$, project participants may choose between the following two historical periods (This allows some flexibility; the use of the longer time period may result in a lower standard deviation and the use of the shorter period may allow a better reflection of the (technical) circumstances observed during the more recent years).

(a) The three last calendar years (five calendar years for hydro project) prior to the implementation of the project activity; or

(b) The time period from the calendar year following *DATEhist*, up to the

last calendar year prior to the implementation of the project, as long as this time span includes at least three calendar years (five calendar years for hydro project), where *DATEhist* is latest point in time between:

(i) The commercial commissioning of the plant/unit;

(ii) If applicable: the last capacity addition to the plant/unit; or

(iii) If applicable: the last retrofit of the plant/unit

$\sigma_{historical}$	Standard deviation of the annual average historical net electricity supplied to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity (MWh)
$DATE_{BaselineRretrofit}$	Point in time when the existing equipment would need to be replaced in the absence of the project activity (date)

<u>CO_2 Emission Factor:</u>

<u>For the current PoA, the grid emission factor will be calculated at the PoA level, and all the CPAs would use the emission factor specified in the PoA-DD.</u>

The Emission factor of the grid applicable for the current PoA and its constituent CPAs are calculated in a transparent and conservative manner using option (a) of the methodology AMS I.D, version 17, by the DNA of Thailand (Thailand Greenhouse Gas Management Organization (TGO)):

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the Emission Factor for an electricity system', version 2.2.1

To find the grid emission factor ($EF_{grid,CM,y}$), Project participants shall apply the following six steps:

STEP 1: Identify the relevant electricity systems.
STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional).
STEP 3: Select a method to determine the operating margin (OM).
STEP 4: Calculate the operating margin emission factor according to the selected method.
STEP 5: Calculate the build margin emission factor.
STEP 6: Calculate the combined margin (CM) emissions factor.

<u>STEP 1: Identify the relevant electricity systems.</u>

According to the "Tool to calculate the emission factor for an electricity system" (version 2.2.1), the project electricity system has to be defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be despatched without significant transmission constraints.

Here the electricity transmission system of Thailand is considered as a single system since the transmission lines are networked throughout the country and owned by the Electricity Generating Authority of Thailand (EGAT). EGAT is the authority that controls electricity generation in Thailand,

whereas the Metropolitan Electricity Authority (MEA) and the Provincial Electricity Authority (PEA) supply electricity to the users in Bangkok and provinces, respectively.

STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional)

In Thailand, the generated electricity that is transferred to the national grid is the only available data. Thus, it is not possible to obtain off-grid electricity generation data. As such, in accordance with Option I, only grid-connected power plants are included in the calculation of the operating margin and build margin emission factor.

STEP 3: Select a method to determine the operating margin (OM)

According to the "Tool to calculate the emission factor for an electricity system" (version 2.2.1), to calculate the operating margin ($EF_{grid, OM, and\ y}$) project developers have the option to select from the following four methods:

(a) Simple OM; or
(b) Simple adjusted OM; or
(c) Dispatch data analysis OM; or
(d) Average OM.

According to Thailand's data, the simple OM method (Ex ante Option) is the most appropriate method. The data for the years 2008, 2009, 2010 have been used because low-cost/must-run (LCMR) power plants include hydro and renewable power plants. The quantity of the electricity generated by the power plants is not included in the calculation because it is less than 50% of the total grid generation.[15]

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on option (a), Simple OM. This is calculated using the *ex ante* option, based on the most recent grid data available.

STEP 4: Calculate the operating margin emission factor according to the selected method

The Operating Margin emission factor can be calculated using Simple OM Option B, based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,\ OMsimple,\ y} = \frac{\sum FC_{i,y} \times NCV_{i,y} \times EF_{co2,i,y}}{EG_y}$$

Where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)

$FC_{i,y}$[16] = Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)

$NCV_{i,y}$[17] = Net Calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit)

[15] SD_6-GEFREPORT_EN, -3

[16] SD_6-GEFREPORT_EN, Page 3

$EF_{co2,i,y}$[18] = CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)

EG_y[19] = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must run power plants/units, in year y (MWh)

i = All fossil fuel types combusted in power sources in the project electricity system in year y

y = The relevant year as per the data vintage chosen

Thus under this option, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the electricity system, not including LCMR, and based on fossil fuel type and total fuel consumption of the project electricity system.
Thus according to Thailand DNA (TGO), the Operating margin emission factor (Ex-ante option) is as follows:

Table 7: Operating Margin Emission Factor of Thailand[20]

Year	CO_2 Emission (tCO_2)	Grid Consumption (GWh)	OM Emission Factor (tCO_2/MWh)
2010	88,452,0088	152,603.73	0.5796
2009	82,178,673	136,193.80	0.6034
2008	84,083,369	136,116,14	0.6177
Summary	**254,714,130**	**424,913.67**	**0.5994**

STEP 5: Calculate the build margin emission factor.
As per the Tool, project participants can choose between one of the following two options regarding data vintage:

Option 1: For the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin

[17] SD_6-GEFREPORT_EN, Page 3

[18] SD_6-GEFREPORT_EN, Page 3

[19] SD_6-GEFREPORT_EN Page 3

[20] SD_6-GEFREPORT_EN, Table 5

emissions factor shall be calculated ex ante, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

Option (1) shall be selected regarding vintage of data, and therefore the build margin emission factor shall be calculated ex ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation.

As per the latest version of the *"Tool to calculate the emission factor for an electricity system"*,

"The sample group of power units m used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-}units}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$, in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh);

(c) From $SET_{5\text{-}units}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Identify the date when the power units in SET_{sample} started to supply electricity to the grid.
If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. In this case ignore steps (d), (e) and (f).

Otherwise:

(d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activities, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample\text{-}CDM}$) the annual electricity generation ($AEG_{SET\text{-}sample\text{-}CDM}$, in MWh);
If the annual electricity generation of that set is comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEG_{SET\text{-}sample\text{-}CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample\text{-}CDM}$ to calculate the build margin. Ignore steps (e) and (f).

Otherwise:
(e) Include in the sample group $SET_{sample\text{-}CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

(f) The sample group of power units m used to calculate the build margin is the resulting set ($SET_{sample\text{-}CDM}$->10yrs)".

The group of power units chosen for the calculation of Build Margin (BM) emission factor is determined using option 1 (ex ante) and steps (a) - (c) as stated above, based on the data from The Study of emission factor for an electricity system in Thailand 2009[21]:

(a) $AEG_{SET\text{-}5\text{-}units}$

Table 8: Set of five most recently built power units

Power Unit	Grid Generation (GWh)	COD
North Bangkok Power Plant (Unit 01)	1,584.22	19-Nov-10
Bangpakong Power Plant (Unit 05)	4,643.22	16-Sep-09
Phu Kieaw Bio Power Project 2	79.46	15-Sep-09
Dan Chang Bio Power Project 2	76.75	15-Sep-09
South Bangkok Power Plant (Unit 03)	4,431.92	1-Mar-09
Total	10,815.57	-

(b) AEG_{total} = 160,190.96 GWh (2010 grid data generation)
$AEG_{SET\text{-}\geq 20\%}$ = 32,934.25 GWh (which is 20.56% of the AEG_{total})
(c) By comparing the values of option (a) which is 10,815.57 GWh and option (b) $AEG_{SET\text{-}\geq 20\%}$ = 32,934.25, we can infer that, option (b) is greater than option (a), therefore option (b) $AEG_{SET\text{-}\geq 20\%}$ set is chosen, i.e. Set_{sample} is chosen as $AEG_{\text{->}20\%}$.

Steps (d), (e) and (f) are ignored because none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago.
The fuel consumption data of the sample group of power units are shown in table 7 of the Study of emission factor for an electricity system in Thailand 2009[22].

The Build Margin emission factor for 2010 in Thailand is given as follows:

Table 9: Build Margin Emission factor of Thailand[23]

Year	CO_2 Emission (tCO_2)	Grid Consumption (GWh)	BM Emission Factor (tCO_2/MWh)
2010	13,933,412	32,934.25	**0.4231**

The build margin is the generation-weighted average emission factor of all power units m during the most recent year y of which electricity generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

[21]SD_6-GEFREPORT_EN, Table 6

[22]SD_6-GEFREPORT_EN,Table 7

[23]SD_6-GEFREPORT_EN,Table 8

where:

$EF_{grid,BM,y}$	Build margin CO_2 emission factor in year *y,* tCO_2/MWh
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y,* tCO_2/MWh
$EF_{EL,m,y}$	CO_2 emission factor of power unit *m* in year *y*, tCO_2/MWh
m	Power units included in the build margin
y	Most recent historical year for which electricity generation data is available

STEP 6: Calculate the combined margin (CM) emissions factor.

The combined margin emission factor can be calculated using option (a), the Weighted Average CM,as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM}$$

$EF_{grid,CM,y}$	-	Combine Margin emission factor in year 'y' (tCO_2/MWh)
$EF_{grid,OM,y}$	-	Operating Margin emission factor in year 'y' (tCO_2/MWh)
$EF_{grid,BM,y}$	-	Build Margin emission factor in year 'y' (tCO_2/MWh)
W_{OM}	-	Weighting of Operating Margin emission factor
W_{BM}	-	Weighting of Build Margin emission factor

According to the "Tool to calculate the emission factor for an electricity system" (version 2.2.1) to For Wind and Solar power generation project, $w_{OM} = 0.75$, $w_{BM} = 0.25$.According to Thailand DNA's (TGO) calculation, the combined margin grid emission factors for Thailand are as follows:

Table 10: Combined Margin Emission factor of Thailand[24]

CDM Project type	$EF_{grid,OM}$ (tCO_2/MWh)	$EF_{grid,BM}$ (tCO_2/MWh)	$EF_{grid,CM}$ (tCO_2/MWh)
General Project	0.5996	0.4231	**0.5113**
Wind and Solar power generation project	0.5996	0.4231	**0.5554**

Project Emissions:

According to the methodology AMS I.D version 17, the project emissions for a solar PV installation are zero, $PE_y = 0$.

Leakage:

The energy equipments of a solar PV installation eligible for inclusion in this PoA are not transferred from another project activity, so the leakage is considered to be zero. $LE_y = 0$

[24]SD_6-GEFREPORT_EN,Table:10

Emission Reductions:

$ER_y = BE_y – PE_y - LE_y$

Where:

ER_y	Emission reductions in year *y* (t CO_2/y)
BE_y	Baseline Emissions in year *y* (t CO_2/y)
PE_y	Project emissions in year *y* (t CO_2/y)
LE_y	Leakage emissions in year *y* (t CO_2/y)

E.6.3. Data and parameters that are to be reported in CDM-SSC-CPA-DD form:

Data / Parameter:	**IC_y**
Data unit:	MW
Description:	Total Installed Capacity
Source of data used:	Power purchase agreement and/or Feasibility Study Report and/or Technical design documentation, and/or EPC contract.
Value applied:	To be specified at the CPA level
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value reflects the expected capacity to be installed at the power plant according to the plant design parameters.
Any comment:	Actual installed capacity might be slightly different than the planned at the time of inclusion. CPA Owners are obliged to notify the CME of the actual installed capacity and also any changes to the installed capacity.

Data / Parameter:	**$EF_{CO2, grid, y}$** ($EF_{grid,CM,y}$)
Data unit:	tCO_2/MWh
Description:	Combined margin Grid Emission factor
Source of data used:	Thailand Greenhouse Gas Management Organisation (TGO)- Host Designated National Authority (DNA)
Value applied:	0.5554[25]
Justification of the choice of data or description of measurement methods and procedures	This is the data published by the Thai DNA, Thailand Greenhouse Gas Management Office (TGO). The calculation is also in line with the latest version of the *"Tool to calculate the emission factor for an electricity system."* This is the most authentic data available about Thailand's grid emission factor currently.

[25] SD_6-GEFREPORT_EN,table 10

actually applied :	
Any comment:	Note that $EF_{CO2,grid,y}$ is the parameter notation taken from Equation (1) of the Methodology, while $EF_{grid,CM,y}$ is the equivalent notation for the same parameter used in the "Tool to calculate the emission factor of an electricity system"

Data / Parameter:	**$EF_{grid,BM,y}$**
Data unit:	tCO_2/MWh
Description:	Build margin Grid Emission factor
Source of data used:	Thailand DNA (TGO)
Value applied:	0.4231
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is the data publish by the Thai DNA, Thailand Greenhouse Gas Management (TGO). The calculations are also in line with the latest version of *"Tool to calculate the emission factor for an electricity system."* This is the most authentic data available about Thailand's grid emission factor currently.
Any comment:	-

Data / Parameter:	**$EF_{grid,OM,y}$**
Data unit:	tCO_2/MWh
Description:	Operating margin Grid Emission factor
Source of data used:	Thailand DNA (TGO)
Value applied:	0.5996
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is the data publish by the Thai DNA, Thailand Greenhouse Gas Management (TGO). The calculation is also in line with the latest version of *"Tool to calculate the emission factor for an electricity system."* This is the most authentic data available about Thailand's grid emission factor currently.
Any comment:	-

Data / Parameter:	$\sigma_{historical}$
Data unit:	MWh/yr
Description:	Standard deviation of the annual average historical net electricity generation delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity.
Source of data used:	Historical records of electricity generation and sale to grid of existing plant, such as plant log-books and/or electricity sales receipts, as appropriate for each CPA.
Value applied:	To be specified in the CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated from data used to establish $EG_{historical}$ Parameter to be calculated as the standard deviation of the annual generation data used to calculate $EG_{historical}$ for retrofit or replacement project activities.

Any comment:	$\sigma=\sqrt{\sum(x-x')^2/n}$; where x' is the mean, n is the number of data points, x is the data value and σ is the standard deviation.

Data / Parameter:	$EG_{historical}$
Data unit:	MWh
Description:	Annual average historical net electricity generation by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity (MWh)
Source of data used:	Historical records of electricity generation and sale to grid of existing plant, such as plant log-books and/or electricity sales receipts, as appropriate for each CPA.
Value applied:	To be specified in the CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	Average of historical net electrical energy levels delivered by the existing facility, spanning all data from the most recent available year (or month, week or other time period) to the time at which the facility was constructed, retrofit, or modified in a manner that significantly affected output (i.e. by 5% or more), shall be used. To determine $EG_{historical}$, project participants may choose between the following two historical periods (This allows some flexibility; the use of the longer time period may result in a lower standard deviation and the use of the shorter period may allow a better reflection of the (technical) circumstances observed during the more recent years). (a) The three last calendar years (five calendar years for hydro project) prior to the implementation of the project activity; or (b) The time period from the calendar year following *DATEhist*, up to the last calendar year prior to the implementation of the project, as long as this time span includes at least three calendar years (five calendar years for hydro project), where *DATEhist* is latest point in time between: (i) The commercial commissioning of the plant/unit; (ii) If applicable: the last capacity addition to the plant/unit; or (iii) If applicable: the last retrofit of the plant/unit
Any comment:	-

Data / Parameter:	$DATE_{BaselineRetrofit}$
Data unit:	Date
Description:	Point in time when the existing equipment would need to be replaced in the absence of the project activity (date)
Source of data used:	Date of end of technical lifetime of existing baseline equipment as per manufacturer's specifications.
Value applied:	To be specified in the CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	Solar panels have a relatively standardized technical lifetime and this lifetime is not influenced by the need for regular or specific maintenance of the panels; as such, the manufacturer's specifications provide an independent, consistent and reliable estimate.
Any comment:	To be assessed in more detail at the CPA level if required.

E.7. Application of the monitoring methodology and description of the monitoring plan:

D.7.1. Data and parameters to be monitored by each SSC-CPA:

Data / Parameter:	***$EG_{facility,y}$***
Data unit:	MWh/y
Description:	Quantity of net electricity supplied to the grid in year y
Source of data to be used:	Measured by electricity meters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each CPA-DD
Description of measurement methods and procedures to be applied:	Continuous monitoring, hourly measurement and at least monthly recording. The net electricity supplied to a grid is the difference between the measured quantities of the grid electricity export ($EG_{exp,y)}$ and the import ($EG_{imp,y)}$: $EG_{facility,y} = EG_{exp,y} - EG_{imp,y}$
QA/QC procedures to be applied:	Meters will be calibrated at appropriate intervals according to the PEA standards (i.e. national standards[26]). Measurement results shall be cross checked with records for sold/purchased electricity.
Any comment:	"$EG_{facility,y}$" is the monitoring parameter used to monitor quantity of net electricity supplied to the grid in the year y, as per Table 1: Parameters for monitoring during the crediting period, S.No 5, page 11/16 of AMS.I.D, version 17. $EG_{facility,y}$ is equivalent to $EG_{BL,y}$ from AMS I.D Equation (1) and is also equivalent to $EG_{PJ,facility,y}$ in the case of capacity additions, as per Equation (3). This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Note: $\sigma_{historical}$ is not a monitored parameter but a calculated value. Therefore it is included in the section E.6.3 of the PoA-DD.

E.7.2. Description of the monitoring plan for a SSC-CPA:

Monitoring Plan Objective

Each CPA owner will monitor the electricity supplied to the national grid by the individual project (CPA). The data will be archived electronically or manually and be stored for 2 years after the end of crediting period of each CPA.
The data will also be sent regularly to the CME.

Monitoring Parameter

[26] SD_24-INTERCONNECTIONCODE_PEA_EN[1], Para-6, Page-7

The electricity consumption (EG_{imp}) and the electricity fed into the grid (EG_{exp}) are to be monitored continuously and recorded at least monthly. Meters will be calibrated as per manufacturer's specification.

QA & QC

The meter data will be compared with the monthly electricity bill/receipts and thus would be verified.

These QA & QC procedures will be followed for all the SSC-CPAs.

E.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

Date of completing the baseline study and monitoring methodology: 26/12/2011

The baseline and monitoring sections have been prepared by Biosphere Capital Pte Ltd (BC). BC is the CDM project developer who developed this PoA.

Company name : Biosphere Capital Pte Ltd
Address : 310A Lavender Street, Singapore 338815
Contact Person : Dr. Wilfred Walsh
Telephone number : +65 6733 9867
Email : wwalsh@biospherecapital.com

Annex 1

CONTACT INFORMATION ON COORDINATING/MANAGING ENTITY and PARTICIPANTS IN THE PROGRAMME of ACTIVITIES

Organization:	GRT Energy Co., Ltd.
Street/P.O.Box:	Sukhumvit 42, Sukhumvit Rd, Phrakhanong, Klongtoey
Building:	2/260 Nusasiri Grand Condo, 26th Fl
City:	Bangkok
State/Region:	-
Postfix/ZIP:	10110
Country:	Thailand
Telephone:	+66 (2) 712-4222
FAX:	+66 (2) 713-6588
E-Mail:	pshinawatra@grt-energy.com
URL:	http://www.grt-energy.com/
Represented by:	Piroon Shinawatra
Title:	CEO
Salutation:	Mr.
Last Name:	Shinawatra
Middle Name:	-
First Name:	Piroon
Department:	-
Mobile:	-
Direct FAX:	-
Direct tel:	-
Personal E-Mail:	-

Organization:	Tricorona Carbon Asset Management Pte Ltd
Street/P.O.Box:	16 Raffles Quay
Building:	#32-04, Hong Leong Building
City:	Singapore
State/Region:	-
Postfix/ZIP:	048581
Country:	Singapore
Telephone:	+65-6499 1288
FAX:	+65-6499 1299
E-Mail:	
URL:	www.tricorona.com
Represented by:	Moe Moe Oo
Title:	Managing Director
Salutation:	Mr
Last Name:	Oo
Middle Name:	
First Name:	Moe Moe
Department:	
Mobile:	+65-9008 5980
Direct FAX:	-
Direct tel:	-
Personal E-Mail:	-

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Annex 3

BASELINE INFORMATION

Table 1: Quantity of electricity generated and delivered to the national grid for years [27]

Generation System	Grid Generation (GWh)				
	EGAT	IPP	SPP	Total	%
2010					
Summary	78,517.70	67,775.98	13,897.27	160,190.96	100.00
Non LC/MR	73,185.41	67,775.98	11,642.33	152,603.73	95.26
LC/MR [5]	5,332.30	—	2,254.94	7,587.23	4.74
Thermal	27,289.03	15,408.42	2,162.89	44,860.34	
Combined-Cycle	38,338.71	52,367.56	8,655.76	99,362.04	
Gas Turbine	276.30	—	823.67	1,099.97	
Diesel Engine	3.98	—	—	3.98	
Hydropower	5,325.20	—	23.64	5,348.84	
Renewable Energy	7.10	—	2,231.30	2,238.40	
Electricity Import	7,277.39	—	—	7,277.39	
2009					
Summary	66,488.10	64,840.72	13,971.37	145,300.19	100.00
Non LC/MR	59,541.66	64,840.72	11,811.42	136,193.80	93.73
LC/MR	6,946.44	—	2,159.95	9,106.39	6.27
Thermal	23,463.69	12,388.03	2,225.63	38,077.35	
Combined-Cycle	33,164.46	52,452.69	8,752.19	94,369.35	
Gas Turbine	309.63	—	833.60	1,143.23	
Diesel Engine	1.44	—	—	1.44	
Hydropower	6,941.74	—	23.97	6,965.71	
Renewable Energy	4.70	—	2,135.98	2,140.68	
Electricity Import	2,602.43	—	—	2,602.43	
2008					
Summary	63,719.02	67,420.14	14,092.83	145,232.00	100.00
Non LC/MR	56,791.19	67,420.14	11,904.81	136,116.14	93.72
LC/MR	6,927.83	—	2,188.03	9,115.86	6.28
Thermal	26,778.89	14,398.34	1,996.83	43,174.06	
Combined-Cycle	26,449.20	53,021.80	9,029.90	88,500.90	
Gas Turbine	659.33	—	878.07	1,537.41	
Diesel Engine	2.30	—	—	2.30	
Hydropower	6,926.02	—	28.77	6,954.79	
Renewable Energy	1.81	—	2,159.26	2,161.07	
Electricity Import	2,901.47	—	—	2,901.47	

[27] SD_6-GEFREPORT_EN, Table 2

Generation System	Grid Generation (GWh)				
	EGAT	IPP	SPP	Total	%
2010					
Summary	78,517.70	67,775.98	13,897.27	160,190.96	100.00
Non LC/MR	73,185.41	67,775.98	11,642.33	152,603.73	95.26
LC/MR [5]	5,332.30	—	2,254.94	7,587.23	4.74
Thermal	27,289.03	15,408.42	2,162.89	44,860.34	
Combined-Cycle	38,338.71	52,367.56	8,655.76	99,362.04	
Gas Turbine	276.30	—	823.67	1,099.97	
Diesel Engine	3.98	—	—	3.98	
Hydropower	5,325.20	—	23.64	5,348.84	
Renewable Energy	7.10	—	2,231.30	2,238.40	
Electricity Import	7,277.39	—	—	7,277.39	
2009					
Summary	66,488.10	64,840.72	13,971.37	145,300.19	100.00
Non LC/MR	59,541.66	64,840.72	11,811.42	136,193.80	93.73
LC/MR	6,946.44	—	2,159.95	9,106.39	6.27
Thermal	23,463.69	12,388.03	2,225.63	38,077.35	
Combined-Cycle	33,164.46	52,452.69	8,752.19	94,369.35	
Gas Turbine	309.63	—	833.60	1,143.23	
Diesel Engine	1.44	—	—	1.44	
Hydropower	6,941.74	—	23.97	6,965.71	
Renewable Energy	4.70	—	2,135.98	2,140.68	
Electricity Import	2,602.43	—	—	2,602.43	
2008					
Summary	63,719.02	67,420.14	14,092.83	145,232.00	100.00
Non LC/MR	56,791.19	67,420.14	11,904.81	136,116.14	93.72
LC/MR	6,927.83	—	2,188.03	9,115.86	6.28
Thermal	26,778.89	14,398.34	1,996.83	43,174.06	
Combined-Cycle	26,449.20	53,021.80	9,029.90	88,500.90	
Gas Turbine	659.33	—	878.07	1,537.41	
Diesel Engine	2.30	—	—	2.30	
Hydropower	6,926.02	—	28.77	6,954.79	
Renewable Energy	1.81	—	2,159.26	2,161.07	
Electricity Import	2,901.47	—	—	2,901.47	

Table 2 : Electricity generation by the most recently built power plants[28]

Power Unit	Grid Generation [7] (GWh)	COD
1. North Bangkok Power Plant (Unit 01)	1,584.22	19-Nov-10
2. Bangpakong Power Plant (Unit 05)	4,643.22	16-Sep-09
3. Phu Kieaw Bio Power Project 2	79.46	15-Sep-09
4. Dan Chang Bio Power Project 2	76.75	15-Sep-09
5. South Bangkok Power Plant (Unit 03)	4,431.92	1-Mar-09
6. Chana Power Plant (Unit 01)	5,090.02	15-Jul-08
7. Ratchaburi Power Company Limited (RPCL) (Unit 1&2)	7,124.72	1-Jul-08
8. Gulf Power Generation Co., Ltd. (Unit 1&2)	9,903.93	1-Mar-08
Summary	32,934.25	
Percentage as of 2010 Grid Generation (160,190.96 GWh)	20.56	

[28] SD_6-GEFREPORT_EN, Table 6

Annex 4

MONITORING INFORMATION

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