

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam

CDM – Executive Board



page 1

**CLEAN DEVELOPMENT MECHANISM
SMALL-SCALE PROGRAM ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) Version 01**

CONTENTS

- A. General description of CDM programme activity (CPA)
- B. Eligibility of CPA and Estimation of Emission Reductions
- C. Environmental Analysis
- D. Stakeholder comments

Annexes

Annex 1: Contact information on entity/individual responsible for the CPA

Annex 2: Information regarding public funding

Annex 3: Baseline information

Annex 4: Monitoring plan

NOTE:

- (i) This form is for submission of CPAs that apply a small scale approved methodology using the provision of the proposed small scale CDM PoA.
- (ii) The coordinating/managing entity shall prepare a CDM Small Scale Programme Activity Design Document (CDM-SSC-CPA-DD)^{1,2} that is specific to the proposed PoA by using the provisions stated in the SSC PoA DD. At the time of requesting registration the SSC PoA DD must be accompanied by a CDM-SSC CPA-DD form that has been specified for the proposed SSC PoA, as well as by one completed CDM-SSC CPA-DD (using a real case). After the first CPA, every CPA that is added over time to the SSC PoA must submit a completed CDM-SSC CPA-DD.

¹ The latest version of the template form CDM-CPA-DD is available on the UNFCCC CDM web site in the reference/document section.

² At the time of requesting validation/registration, the coordinating managing entity is required to submit a completed CDM-POA-DD, the PoA specific CDM-CPA-DD, as well as a completed CDM-CPA-DD (using a real case).

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam

CDM – Executive Board



page 2

SECTION A. General description of small scale CDM programme activity (CPA)

A.1. Title of the small-scale CPA:

Installing Solar Water Heating Systems in the South of Viet Nam - XX

Version XX

DD/MM/YYYY

A.2. Description of the small-scale CPA:

The purpose of the proposed small-scale Component Project Activity “Installing Solar Water Heating Systems in the South of Viet Nam-XX” (hereafter referred to as “CPA-XX”) is to install new residential solar water heating (SWH) systems under a programme, Installing Solar water Heating Systems in the South of Viet Nam (hereafter referred to as “PoA”), coordinated by the Energy Conservation Center of Ho Chi Minh City (ECC).

The PoA is a voluntary action initiated by the ECC in order to increase the number of SWH systems installed in households in the South of Viet Nam through a subsidy programme with a media campaign to raise awareness of the benefits of SWH systems among people in Viet Nam. The cost of the SWH systems will be subsidised as an incentive to encourage people to install SWH systems. The SWH systems will reduce demand for electricity used for heating water, thereby reducing emissions of greenhouse gases (GHGs).

The implementer of the CPA-XX is the ECC which is the coordinating entity of the overall PoA as well. The CPA-XX consists of the SWH systems installed into the households in XXX and XXX [name of the province or city] by the SWH system distributors who are officially registered under the installation programme of the ECC. The SWH distributors whose products comply with technical requirements for SWH systems TCVN8251: 2009 announced by the Ministry of Science and Technology, Viet Nam are qualified to register in the programme.

Through the CPA-XX under the PoA, the energy source for providing heated water will come from solar energy and displace electricity which would have been consumed from the Vietnamese national grid over seven (7) years. GHGs associated with electricity production will be reduced as a result. The proposed CPA-XX is expected to reduce XX tCO₂ throughout the crediting period.

This CPA-XX will contribute to the sustainable development of Viet Nam in the following ways:

Economic dimension –Current electricity supply is not enough to meet projected demand especially in the southern region of Viet Nam. The Vietnamese Government is promoting energy conservation as well as expanding the electric supply capacity in order to support the rapid development of the economy. The CPA-XX will reduce energy consumption for water heating for households in the South of Viet Nam and help secure the electricity supply required for the country’s continued economic growth.

Environmental dimension – The CPA-XX will reduce electricity consumption, thereby reducing the amount of GHGs produced by fossil fuel combustion at the national electricity grid. Through promotional activities in the mass media such as television and newspaper advertisements to enhance the

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 3

use of SWH systems, the ECC will communicate the economic and environmental benefits of the SWH systems. This publicity will raise awareness of renewable energy and energy conservation among the Vietnamese people.

Social dimension – The use of electric water heaters in the bathroom sometimes causes electric shock, which is a common concern for people who have small children. The introduction of SWH systems will provide a safe and steady supply of hot water and hence increase the quality of life of people in Viet Nam.

Through the programme jobs will be created in the solar sector, with training provided for technicians to install and maintain the SWH systems.

A.3. Entity/individual responsible for the <u>small-scale CPA</u>:

The implementer for the CPA-XX is the Energy Conservation Center of Ho Chi Minh City.

A.4. Technical description of the <u>small-scale CPA</u>:

A.4.1. Identification of the <u>small-scale CPA</u>:

A.4.1.1. <u>Host Party</u>:

Socialist Republic of Viet Nam

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 4

A.4.1.2. Geographic reference or other means of identification allowing the unique identification of the small-scale CPA (maximum one page):

The implementer for the CPA-XX is the ECC. Contact details of the entity / individual responsible for the CPA-XX is provided in Annex1. The physical boundary of the CPA-XX is the SWH systems installed under the CPA-XX also includes the national electricity grid from which electricity is sourced in the baseline scenario. The CPA-XX consists of the SWH systems installed by the distributors who are officially registered in the programme. The SWH distributors whose products comply with technical requirements for SWH systems TCVN8251: 2009 announced by the Ministry of Science and Technology, Viet Nam are qualified to register in the programme. The geographic boundary of the CPA-XX is XXX, and XXX 【name of the province or city】 with its geographic coordinates of each province is shown in below table.

Province/City	Latitude	Longitude
XXXXXX	XXXXXX	XXXXXX
XXXXXX	XXXXXX	XXXXXX
XXXXXX	XXXXXX	XXXXXX
XXXXXX	XXXXXX	XXXXXX
XXXXXX	XXXXXX	XXXXXX
XXXXXX	XXXXXX	XXXXXX

Each SWH system to be installed under the CPA-XX will be uniquely identified. The ECC will keep the following information for all SWH systems to be installed under the CPA-XX in order to identify the location of the systems, thus the information allows the unique identification of the CPA-XX:

- Location of SWH system registered under the CPA-XX;
- Name of the SWH system owner;
- Installation date of the SWH system;
- SWH system distributor and technical specifications of the SWH system;
- SWH system sequential registration number;
- Results of acceptance testing;
- Results of annual inspection for the sample group;
- Crediting period of the CPA-XX
- Status of verification of the CPA-XX.

Above information will be made available during verification.

SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 5

【Add map of geographical boundary of the CPA-XX】

Figure 1. Geographical boundary of the CPA-XX

A.4.2. Duration of the small-scale CPA:

A.4.2.1. Starting date of the small-scale CPA:

The starting date of the CPA-XX is DD/MM/YYYY. This is the 【date or expected date】 on which the contract with the first SWH distributor who will participate in the CPA-XX and the ECC 【was or will be signed】 .

A.4.2.2. Expected operational lifetime of the small-scale CPA:

15 years and 0 month

A.4.3. Choice of the crediting period and related information:

Renewable crediting period

A.4.3.1. Starting date of the crediting period:

The starting date of the crediting period is DD/MM/YYYY or the date of inclusion of the CPA-XX into the registered PoA, whichever occurs later.

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 6

A.4.3.2. Length of the crediting period, first crediting period if the choice is renewable CP:

7 years

The duration of crediting period of the CPA-XX shall be limited to the end date of the PoA regardless of when the CPA-XX was added.

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

Year	Annual estimation of emission reductions in tonnes of CO ₂ e
1	XX
2	XX
3	XX
4	XX
5	XX
6	XX
7	XX
Total estimated reductions (tCO₂e)	XX
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tCO₂e)	XX

A.4.5. Public funding of the CPA:

The CPA-XX will not receive any public funds resulting from official development assistance from Parties included in Annex I to the Convention.

A.4.6. Information to confirm that the proposed small-scale CPA is not a de-bundled component

As per the “Guidelines on assessment of the de-bundling for SSC project activities” (version 03), Section II, “Guidance for determining the occurrence of de-bundling under a programme of activities (PoA)”, Paragraph 10, as each independent subsystems/measures included in a CPA of the PoA is no greater than 1% of the small scale threshold defined by the methodology applied, then the CPA is exempted from performing a de-bundling check and is not considered a de-bundled component of a large scale activity.

According to “General guidelines to SSC CDM methodologies”, version 17, Paragraph 4 (d), the maximum output capacity for thermal application of solar energy projects shall be 64,000 m² of the collector area. The SWH system installed under a CPA of the PoA will have size of collector area not exceeding 8 m² of a threshold of very small residential SWH systems determined in the methodology AMS-IJ version 01, which is less than 0.0125% of the small scale threshold. Therefore, the CPA-XX of the PoA is exempt from performing a de-bundling check and is not considered a de-bundled component of a large scale activity.

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 7

A.4.7. Confirmation that the small-scale CPA is neither registered as an individual CDM project activity nor is part of another Registered PoA:

The CPA-XX is neither registered as or part of an individual CDM project activity, nor is it part of any other registered PoA. All SWH systems in the CPA-XX will be uniquely identified and recorded in the database developed by the ECC. The ECC will confirm that each SWH system in the CPA-XX is not a part of an individual CDM project or a part of any other registered PoA.

SECTION B. Eligibility of small-scale CPA and Estimation of emissions reductions

B.1. Title and reference of the Registered PoA to which small-scale CPA is added:

Installing Solar Water Heating Systems in the South of Viet Nam, version X

B.2. Justification of the why the small-scale CPA is eligible to be included in the Registered PoA :

The CPA-XX meets eligibility criteria for inclusion of the CPA described in Section A.4.2.2 of the CDM-SSC-PoA-DD:

The eligibility criteria of a CPA to be included in the PoA	Analysis of the CPA-XX	Check
Criterion 1. A CPA is located in the south of Viet Nam composed of Ho Chi Minh City and 21 provinces described in the Section A.4.1.2. of CDM-SSC-PoA-DD.	【Add the relevant description of the CPA-XX】	<input type="checkbox"/>
Criterion 2. The database is set for a CPA and a sequential registration number will be assigned for the SWH systems under a CPA.	【Add the relevant description of the CPA-XX】	<input type="checkbox"/>
Criterion 3. The SWH systems under a CPA are purchased from and installed by distributors who are registered under the installation program of the ECC.	【Add the relevant description of the CPA-XX】	<input type="checkbox"/>
Criterion 4. The size of collector surface area of the SWH system installed under a CPA do not exceed 8 m ² of a threshold of very small residential SWH systems determined in the methodology AMS-I.J.	【Add the relevant description of the CPA-XX】	<input type="checkbox"/>
Criterion 5. The SWH systems under a CPA are systems with either flat plate or evacuated tube collectors.	【Add the relevant description of the CPA-XX】	<input type="checkbox"/>
Criterion 6. The SWH systems under a CPA are passive systems without a forced circulation system or auxiliary heat source.	【Add the relevant description of the CPA-XX】	<input type="checkbox"/>

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 8

Criterion 7. The SWH systems under a CPA comply with technical requirements for SWH systems TCVN8251: 2009 announced by the Ministry of Science and Technology, Viet Nam and the requirements given below: -Unglazed collector must be stabilized against UV degradation; -Glazed collector must have at least one glass cover and be insulated on the sides and back to achieve a loss coefficient not more than 5 W/m ² C; -Evacuated tube collector must maintain vacuum insulation between absorber and ambient.	【Add the relevant description of the CPA-XX】	<input type="checkbox"/>
Criterion 8. The volume of storage tanks of the SWH systems under a CPA is at least 50 litres per square meter of collector area.	【Add the relevant description of the CPA-XX】	<input type="checkbox"/>
Criterion 9. The tilt and orientation of the solar collectors shall be +/-45 of due equator and a tilt +15 to -25 degrees of latitude. This requirement shall be ensured by the acceptance testing.	【Add the relevant description of the CPA-XX】	<input type="checkbox"/>
Criterion 10. There must be no shading of the solar collectors between 10am to 2pm on the shortest day of the year at the time of installation. This requirement shall be ensured by the acceptance testing.	【Add the relevant description of the CPA-XX】	<input type="checkbox"/>
Criterion 11. The start date of a CPA is presented through the contract between the ECC and the SWH system distributors who participate in a CPA.	【Add the relevant description of the CPA-XX】	<input type="checkbox"/>
Criterion 12. The SWH systems installed under a CPA are residential SWH systems.	【Add the relevant description of the CPA-XX】	<input type="checkbox"/>
Criterion 13. The SWH systems under a CPA will be installed to the residential buildings which are not temporary or seasonal housings.	【Add the relevant description of the CPA-XX】	<input type="checkbox"/>
Criterion 14. A CPA under the PoA will not receive any public funds resulting from official development assistance from Parties included in Annex I to the Convention.	【Add the relevant description of the CPA-XX】	<input type="checkbox"/>
Criterion 15. Total size of collector surface area of the SWH systems installed under a CPA does not exceed 21,428 m ² of a threshold of microscale project activities throughout the crediting period of a CPA.	【Add the relevant description of the CPA-XX】	<input type="checkbox"/>

B.3. Assessment and demonstration of additionality of the small-scale CPA, as per eligibility criteria listed in the Registered PoA:

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 9

The CPA-XX is additional if the total collector area installed under the CPA is less than 21,428 m², and the end users of SWH systems installed under the CPA are households. The ex-ante estimation of total collector area size of the CPA-XX is estimated to be XXX m², and the end users of SWH systems installed under the CPA-XX will be households. Therefore, the CPA-XX is additional.

B.4. Description of the sources and gases included in the project boundary and proof that the small-scale CPA is located within the geographical boundary of the registered PoA.

The gas reduced through the CPA-XX is CO₂. The CPA-XX reduces electricity consumption by providing energy via SWH systems. According to AMS-I.J., the physical, geographical site of the SWH system delineates the project boundary. The boundary also extends to the facility or facilities consuming the heated water generated by the SWH system. Therefore, the project boundary for the CPA-XX includes the physical site of each SWH system as well as the houses which consume the heated water generated by the SWH systems. The project boundary for the CPA-XX under the PoA also includes the national electricity grid from which electricity is sourced in the baseline scenario. The CPA-XX and SWH system can be uniquely identified based on sequential registration number with the location.

Below table summarizes the sources and gases included in the CPA-XX boundary.

	Source	Gas	Included?	Justification/Explanation
Baseline	Electricity consumption	CO ₂	Included	Heating water consumes electricity, which had been sourced from the national electricity grid.
		CH ₄	Excluded	Excluded for simplification. This is conservative.
		N ₂ O	Excluded	Excluded for simplification. This is conservative.
Project	Heat generation	CO ₂	Excluded	There is no CO ₂ emission.
		CH ₄	Excluded	There is no CH ₄ emission.
		N ₂ O	Excluded	There is no N ₂ O emission.

All the SWH systems in the CPA-XX are installed in XXX and XXX 【name of the province or city】 , which 【is or are】 located within the geographical boundary of the registered PoA. Therefore, the CPA-XX is located within the geographical boundary of the registered PoA.

B.5. Emission reductions:

B.5.1. Data and parameters that are available at validation:

Data / Parameter:	EF_{EL,y}
Data unit:	(tCO ₂ /MWh)
Description:	Emission factor for electricity grid in year y
Source of data used:	Data published by DNA Viet Nam
Value applied:	0.5764

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 10

Justification of the choice of data or description of measurement methods and procedures actually applied :	The grid emission factor is calculated using the “Tool to calculate the emission factor for an electricity system,” according to AMS.I.D., version 17.
Any comment:	---

Data / Parameter:	ES_v
Data unit:	(kWh/m ² /year)
Description:	The stipulated energy saving values
Source of data used:	AMS-I.J version 01
Value applied:	450
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value is used following the stipulated energy saving method which is applicable to residential SWH system projects that displace electricity for water heating. Since the households which install SWH systems under the CPA-XX have substantial hot water demand year round, a value of 450 kWh/year per square meter of collector area is stipulated for energy savings.
Any comment:	---

B.5.2. Ex-ante calculation of emission reductions:

The baseline scenario for the CPA-XX is that electricity is imported from the grid for water heating by consumers. According to Paragraph 9 of AMS-I.J. version 01, emission reductions are calculated as the energy saving that result from the project implementation multiplied by an emission factor for the electricity and/or fossil fuel displaced. For calculating the emission factor for displaced electricity, an annual emission factor shall be calculated in accordance with the provisions in AMS-I.D. version 17, “Grid connected renewable electricity generation”.

Paragraph 10 of AMS-I.J. version 01 provides three methods to determine energy saving that result from the project implementation. The stipulated energy saving method which is applicable to residential SWH system projects that displace electricity for water heating is applied to the CPA-XX under the proposed PoA.

The stipulated energy saving method is applicable only when all the following conditions are satisfied. Justification of the choice of the method is summarized in below table.

	<i>AMS-I.J. requirements</i>	<i>Project Activity</i>
(i)	Individual solar collector area per system is less than or equal to eight square meters per residential unit (e.g. eight square meters for a single family residence or 32 square meters for a four unit apartment building)	The solar collector area of systems installed under the CPA-XX is less than 8 m ² .

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 11

(ii)	The tilt and orientation of the solar collectors shall be +/- 45 of due-equator and a tilt +15 to -25 degrees of latitude	The proper installation of systems is checked by the ECC and the SWH system distributors through the acceptance testing.
(iii)	Thermal storage volume (preheat tank volume) is either: (a) At least 50 litres per square meter of collector area; or (b) Adequate to bridge time gap between solar supply and load demand during an average winter day for a typical installation, as demonstrated by calculation or model	Preheat tank volume of systems installed under the CPA-XX of the PoA is at least 50 liters/ m ² .
(iv)	The sizing calculations of the SWH systems are documented to be such that the average annual, daily amount of water heated by the SWH systems is less than or equal to the average annual, daily hot water demand for a typical installation;	The average household water consumption is approximately 740L/house/day and 34% of it was used for showers ³ . According to the calculation based on the daily solar radiation record for South of Viet Nam ⁴ , the average annual daily amount of water can be heated by the SWH systems with the average solar collectors of 2.07m ² is less than 251L/house/day of average annual daily hot water demand for a typical installation. The solar collector size of 2.07m ² is the average collector size of SWH systems sold in Viet Nam. This was confirmed for the PoA.
(v)	There must be no shading of the solar collectors between 10 am to 2 pm on the shortest day of the year at the time of installation;	The proper installation of systems is checked by ECC and SWH system distributors. There is no shading of the solar collectors between 10am and 2pm on the shortest day of the year at the time of installation.
(vi)	<p>The quality and performance of the solar collectors and SWH systems shall meet the criteria in the OG100 standard at <www.solar-rating.org>, or equivalent national or international standard, or the requirements given below:</p> <ul style="list-style-type: none"> -Unglazed collector must be stabilized against UV degradation; -Glazed collector must have at least one glass cover and be insulated on the sides and back to achieve a loss coefficient not more than 5 W/m²C; -Evacuated tube collector must maintain vacuum insulation between absorber and ambient. 	<p>The SWH systems installed under the CPA-XX of the PoA comply with Vietnamese technical requirements of solar water heaters, TCVN 8251:2009 announced by Ministry of Science and Technology.</p> <p>In addition, the SWH systems installed under a CPA shall meet the following requirements:</p> <ul style="list-style-type: none"> -Unglazed collector must be stabilized against UV degradation; -Glazed collector must have at least one glass cover and be insulated on the sides and back to achieve a loss coefficient not more than 5 W/m²C;

³ Comparing household water end-use data from Vietnam and Australia: Implications for water and wastewater planning, Monique R, et al.

⁴ NASA surface meteorology and solar energy data set, <http://eosweb.larc.nasa.gov/sse/RETScreen/>

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 12

		-Evacuated tube collector must maintain vacuum insulation between absorber and ambient.
--	--	-----------------------------------------------------------------------------------------

The stipulated energy saving method provides two allowable stipulated energy saving values:

- (i) For applications that can be reasonably demonstrated to have substantial hot water consumption demand year round: a single value of 450 kWh/year per square meter of collector area is stipulated for energy savings and is based on 5 kWh/m²/day solar resource, 25% solar water heater efficiency, and 365 days/year of hot water use;
- (ii) For applications that cannot be reasonably demonstrated to have substantial hot water consumption demand year round: a single value of 300 kWh/year per square meter of collector area is stipulated for energy savings.

The CPA-XX under the PoA installs SWH systems to houses located in South of Viet Nam which are not temporary or seasonal housing. In South of Viet Nam under its tropical climate, temperatures undergo few changes throughout the year with averages ranging between 24°C and 28°C, and hence the hot water consumption demand undergoes very little change throughout the year. Therefore, 450kWh/year per square meter of collector area is applied for estimation of energy savings which is multiplied by the aggregate collector area verified to have been installed by the project activity.

According to paragraph 9 to 11 of AMS-I.J. version 01, emission reductions are calculated by a flowing equation.

$$ER_y = ES_y \times \sum_{x=1}^N (A_{x,y} \times D_{x,y}) \times R_y \times 10^{-3} \times EF_{EL,y} \times 1/(1-l_y) \quad (1)$$

Where:

Parameter	Value	Unit	Description
ER_y		(tCO ₂ e /yr)	Emission reduction in year y
ES_y	450	(kWh /m ² /year)	The stipulated energy saving values
$A_{x,y}$	XX	(m ² /year)	The collector area of SWH system x verified to have been installed by the project activity in year y
$D_{x,y}$	XX	-	The proportion of days in which SWH system x is being installed in year y
R_y	XX	-	The proportion of SWH systems that are operational and in compliance with manufacture-required maintenance procedures in year y
$EF_{EL,y}$	0.5764	(tCO ₂ e /MWh)	Emission factor for electricity grid
l_y	XX	-	Average annual technical grid losses during year y
x	-	-	The SWH system unit x
N	XX	(units)	The number of SWH systems installed



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 13

Grid emission factor

Emission factor of the connected grid is calculated using AMS-I.D., version 17. In line with AMS-I.D., Paragraph 12, the emission factor is calculated in a transparent and conservative manner as 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 02.2.1, as follows:

The DNA of Viet Nam published the emission factor of the national electricity grid in the Official Letter No.151/KTTVBDKH dated 26 March 2010⁵.

Step 1. Identify the relevant electric systems

The electricity displaced by the CPA-XX will be delivered from the Vietnamese national grid, the only grid that exists in the country.

Step 2. Select a method to determine the operating margin (OM)

As no dispatch data is available and low cost/must-run resources constitute less than 50% of total grid generation over the past five (5) years, the simple OM method is used (See Table A3.2 in Annex 3). For the simple OM, the ex-ante option is selected.

Step 3. Calculate the operating margin emission factor according to the selected method

The simple OM emission factor is calculated based on total fuel consumption and electricity generation of the system (Option B). The following formula is used to calculate Simple OM:

$$EF_{grid,OMsimple,y} = \frac{\sum_i (FC_{i,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y})}{EG_y} \quad (2)$$

Where:

Parameter	Unit	Description
$EF_{grid,OMsimple,y}$	(tCO ₂ e /MWh)	Simple operating margin CO ₂ emission factor in year y
$FC_{i,y}$	(mass or volume unit)	Amount of fuel type <i>i</i> consumed in the project electricity system in year y
$NCV_{i,y}$	(GJ/mass or volume unit)	Net calorific value (energy content) of fossil fuel type <i>i</i> in year y
$EF_{CO2,i,y}$	(tCO ₂ /GJ)	CO ₂ emission factor of fossil fuel type <i>i</i> in year y (tCO ₂ /GJ)
EG_y	(MWh)	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

⁵ http://www.noccop.org.vn/Data/vbpq/Airvariable_ldoc_vnHe%20so%20phat%20thai.pdf

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 14

i All fossil fuel types combusted in power plant/unit *m* in year *y*
y The three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option)

The operating margin emission factor calculations are performed ex-ante using official data available on fuel consumption and electricity generation for each plant connected to the Vietnamese national grid in 2006-2008. All data is summarized in Table A3.3 in Annex3.

The “Operating Margin” emission factor is calculated as:

$$EF_{OM} = 0.6465 \text{ tCO}_2/\text{MWh}$$

Step 4. Calculate the build margin (BM) emission factor

In terms of vintage of data, Option 1 (ex-ante) was selected for the CPA-XX.

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);

The set of five power units that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and their annual electricity generation ($AEG_{SET\text{-}5\text{-units}}$) are listed in Table A.3.4 in Annex 3.

$$AEG_{SET\text{-}5\text{-units}} = 7,829,812 \text{ MWh}$$

(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);

$$AEG_{\text{total}} = 74,689,636 \text{ MWh}$$

The set of power units that started to supply electricity to the grid most recently and that comprise 20% of ($SET_{\geq 20\%}$) and their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh) are listed in Table A.3.4 in Annex 3.

$$AEG_{SET\text{-}\geq 20\%} = 16,514,761 \text{ MWh}$$

(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

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 15

ago, then use SET_{sample} to calculate the BM.

$AEG_{SET \geq 20\%}$ is larger than $AEG_{SET < 20\%}$.

Therefore, the set of power units that started to supply electricity to the grid most recently and that comprise 20% of ($SET \geq 20\%$) is identified as SET_{sample} . The oldest power units started supply electricity to the grid in 2004 and which is less than 10 years ago.

The BM emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which electricity generation data is available, calculated as follows:

For the CPA-XX, the sample group of power units m used to calculate the build margin consists of the set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. In terms of vintage of data, Option 1 (ex-ante) was selected for the CPA-XX.

The build margin is calculated as the generation-weighted average emission factor (tCO_2/MWh) for a sample of power plants as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (3)$$

Where:

Parameter	Unit	Description
$EF_{grid,BM,y}$	(tCO_2e / MWh)	Build margin CO_2 emission factor in year, y
$EG_{m,y}$	(MWh)	Net quantity of electricity generated and delivered to the grid by power unit m in year, y
$EF_{EL,m,y}$	(tCO_2/MWh)	CO_2 emission factor of power unit m in year, y
m		Power units included in the build margin
y		Most recent historical year for which power generation data is available

For the CPA-XX, Option A1 shall be chosen: Calculate the Build Margin emission factor $EF_{grid,BM,y}$ *ex-ante* based on the most recent information available on plants already built for sample group m at the time of PDD submission. The sample group of power unit m used to calculate the build margin consists of the set of power capacity additions in the electricity system that comprise 20% of the system generation (in GWh) and that have been built most recently. Data for the build margin calculation is shown in the table A3.4 in Annex 3.

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} = \frac{8,362,386.09}{16,514,761.12}$$

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 16

The build margin emission factor is calculated as:

$$EF_{BM} = 0.5064 \text{ tCO}_2/\text{MWh}$$

Step 5. Calculate the combined margin baseline emission factor

The combined margin emission factor is calculated based on weighted average CM method as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (4)$$

Where:

Parameter	Unit	Description
w_{OM}	(%)	Weighting of the operating margin emission factor
w_{BM}	(%)	Weighting of the build margin emission factor

w_{OM} and w_{BM} , by default, are both valued at 50%

The baseline emission factor is calculated as:

$$EF_{EL,y} = EF_{grid,CM,y} = 0.5764 \text{ tCO}_2/\text{MWh}$$

Leakage

The SWH systems to be installed under a CPA of the PoA will not be transferred from another activity and baseline equipments will not be transferred to another activity. Therefore, leakage is not considered.

Based on the projected installation schedule of the ECC-HCMC, the annual emission reductions will be as follows:

<i>Year</i>	<i>SWH Installed</i>	<i>Total SWH Installed (cumulative)</i>	<i>ER_y</i>
1	XX	XX	XX
2	XX	XX	XX
3	XX	XX	XX
4	XX	XX	XX
5	XX	XX	XX
6	XX	XX	XX
7	XX	XX	XX
	[units]	[units]	(tCO ₂ e /yr)

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 17

B.5.3. Summary of the ex-ante estimation of emission reductions:

Year	Estimation of project activity emissions (tCO₂e)	Estimation of baseline emissions (tCO₂e)	Estimation of leakage (tCO₂e)	Estimation of overall emission reductions (tCO₂e)
1	0	XX	0	XX
2	0	XX	0	XX
3	0	XX	0	XX
4	0	XX	0	XX
5	0	XX	0	XX
6	0	XX	0	XX
7	0	XX	0	XX
Total (tCO₂e)	0	XX	0	XX
Annual Average (tCO₂e)	0	XX	0	XX

B.6. Application of the monitoring methodology and description of the monitoring plan:

B.6.1. Description of the monitoring plan:

The monitoring methodology AMS-I.J. “Solar water heating systems (SWH)”, version 01 is applied for the CPA-XX. The methodology consists of the following:

According to AMS-I.J., paragraph 13, 14, and 15, the monitoring procedure for the CPA-XX consists of:

- 1) The ECC will keep a record of the number, location, type, the installation date, and owner of each SWH system under the CPA-XX.
- 2) The SWH system distributors will inspect and undergo acceptance testing (commissioning) for proper operation in compliance with manufacturer specifications within three months of installation of each SWH system under the CPA-XX. The result of acceptance testing shall be sent to the ECC. The ECC will record the result of acceptance testing for each SWH system in the database.
- 3) The ECC will conduct an annual inspection to check the proper operation and in compliance with manufacturer-required maintenance procedures for sampled SWH systems. The sample of the residences where the systems are installed will be selected by simple random sample method to meet 90/10 confidence/ precision following “Standard for sampling and surveys for CDM project activities and programme of activities”, version 02.0. The sampling plan is as below:

The objective of the sampling is determining the rate of SWH systems “R_y” that are demonstrated to be operational and in compliance with manufacture-required maintenance procedures during the crediting period, and with a 90/10 confidence/precision.

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 18

The target population is all SWH systems included in a CPA-XX. Simple random sampling is to be used for the project. The sample size (n) is calculated using the following equation based on the “Best practice examples focusing on sample size and reliability calculations”, version 01.0 for the CPA-XX:

$$n \geq \frac{1.645^2 NV}{(N-1) \times 0.1^2 + 1.645^2 V}$$

Where:

$$V = \frac{p(1-p)}{p^2}$$

n Sample size
 N Total number of SWH systems
 p The expected proportion (R_y)
 1.645 Represents the 90% confidence required
 0.1 Represents the 10% relative precision

The sample size is calculated before conducting the annual inspection of the CPA-XX for every monitoring period based on the number of SWH systems (N), and the expected proportion of SWH systems which are operational and in compliance with manufacture-required maintenance procedures (p).

For the first monitoring period of the CPA-XX, following values are applied to calculate the sample size;

Parameter	Value Applied	Justification of the choice of data
N	XX	Total number of SWH systems installed under the CPA-XX
p	XX	【Add the justification for the CPA-XX】

The sample size for the first monitoring period of the CPA-XX is calculated as following;

$$n \geq \frac{1.645^2 NV}{(N-1) \times 0.1^2 + 1.645^2 V} = XX$$

$$V = \frac{p(1-p)}{p^2} = XX$$

For the first monitoring period of the CPA-XX, XX samples are required to meet 90/10 confidence/precision.

In case the proportion of SWH systems that are demonstrated to be operational and in compliance with manufacture-required maintenance procedures (p) for the first monitoring period is less than expected value (XX), the sample size will be recalculated.

For the following monitoring period, the result of value p from the prior monitoring period should be applied to determine the sample size.

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 19

The ECC will select samples randomly using random number tables from the database every 12 months for the CPA-XX. The assigned staff of the ECC will visit the households that have sample SWH systems to confirm 1) that SWH is operational, and 2) in compliance with manufacture-required maintenance procedures. When the SWH system satisfies both requirements, it is identified as “Success”. The result “Success/Fail” will be recorded in the database. In case the responses cannot be obtained from some sampled households, the additional samples should be selected using random number tables to collect the result from n SWH systems. The proportion “ R_y ” will be calculated after the all n results are recorded in the database. The proportion “ R_y ” will be calculated after the all results are recorded in the database. The sampling frame which is the database including the information of all SWH systems under the CPA-XX will be kept for a period of at least two years after the crediting period of the CPA-XX.

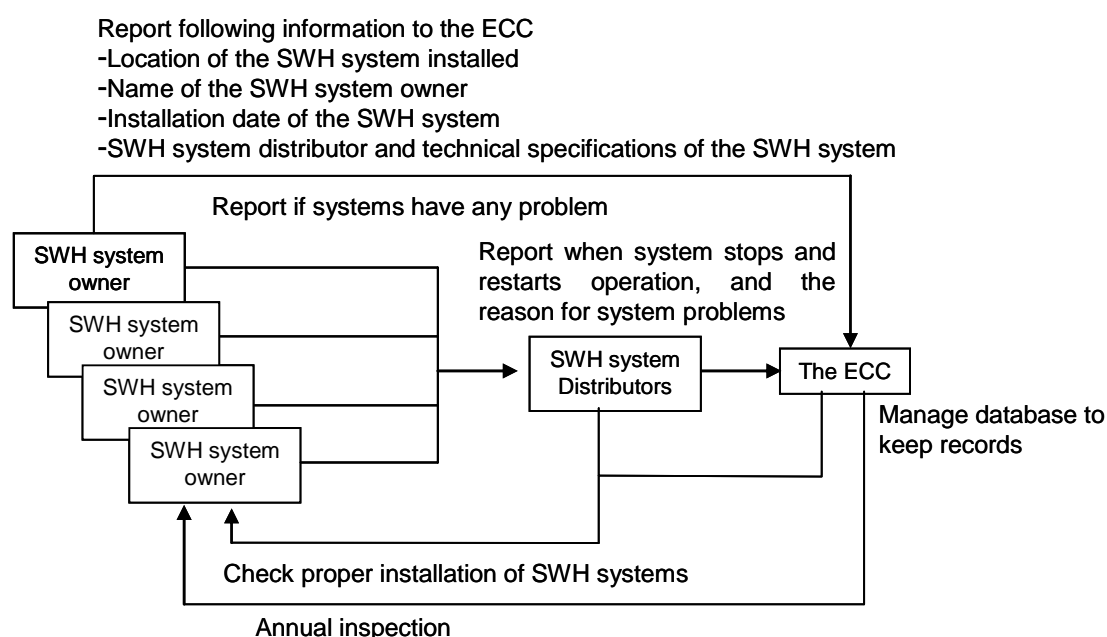
The ECC will prepare the manual include the procedure for identification of sample households, data collection, and analysis. The training is provided to the personnel of the ECC before conducting the annual inspection of the CPA-XX every year.

A database will be set up by the ECC for the CPA-XX under the PoA. The database will include the following information for each SWH system:

- Location of SWH system registered under the CPA-XX;
- Name of the SWH system owner;
- Installation date of the SWH system;
- SWH system distributor and technical specifications of the SWH system;
- SWH system sequential registration number;
- Results of acceptance testing;
- Results of annual inspection for the sample group;
- Crediting period of the CPA-XX;
- Status of verification of the CPA-XX.

The ECC will prepare the monitoring report which covers the monitoring after the project is registered. The report covers number of SWH system units operating, operating days per year of SWH units, and calculation of the emission reductions, etc.

The monitoring structure including the role of each party involved is shown as below.



This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 20

Data / Parameter:	<i>N</i>
Data unit:	units
Description:	The number of SWH systems installed
Source of data to be used:	Data base developed by the ECC
Value of data applied for the purpose of calculating expected emission reductions in section B.5	XX
Description of measurement methods and procedures to be applied:	Directly determined in the course of installing SWH systems included in the CPA-XX. The ECC will collect and record the number of systems installed under the CPA-XX. The value will be monitored continuously.
QA/QC procedures to be applied:	The ECC will cross-check against its internal records of the number of applicants who received the subsidy and the number of SWH systems installed by each applicant.
Any comment:	---

Data / Parameter:	$A_{x,y}$
Data unit:	m ²
Description:	The collector area of the SWH system <i>x</i> verified to have been installed by the project activity in year <i>y</i>
Source of data to be used:	Data base developed by the ECC
Value of data applied for the purpose of calculating expected emission reductions in section B.5	XX
Description of measurement methods and procedures to be applied:	The ECC will record the collector area of each SWH system installed under a CPA based on the specification of each system. The value will be monitored continuously.
QA/QC procedures to be applied:	The ECC will cross-check against its internal records of specification of each SWH system under the CPA-XX and the result of acceptance testing in which the ECC will check the specifications of a SWH system.
Any comment:	---

Data / Parameter:	<i>Result of acceptance test</i>
Data unit:	-
Description:	Result of acceptance test
Source of data to be used:	Database developed by the ECC
Value of data applied for the purpose of	Only the SWH systems which passed the acceptance are to be considered for the calculation of emission reductions. Therefore, the value is not used for the

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 21

calculating expected emission reductions in section B.5	calculation of emission reductions. It is assumed that all XX SWH systems to be installed will pass the acceptance test.
Description of measurement methods and procedures to be applied:	The ECC and the SWH system distributors will inspect and undergo acceptance testing (commissioning) for proper operation in compliance with manufacturer specifications within three months of installation of each SWH system. The ECC will record the result of acceptance testing. The SWH systems do not pass the acceptance test are not included in the CPA-XX.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$D_{x,y}$																
Data unit:	-																
Description:	The proportion of days in which SWH system x is being installed in year y																
Source of data to be used:	Database developed by the ECC																
Value of data applied for the purpose of calculating expected emission reductions in section B.5	<table border="1"> <thead> <tr> <th>Year</th><th>$D_{x,y}$</th></tr> </thead> <tbody> <tr><td>1</td><td>XX</td></tr> <tr><td>2</td><td>XX</td></tr> <tr><td>3</td><td>XX</td></tr> <tr><td>4</td><td>XX</td></tr> <tr><td>5</td><td>XX</td></tr> <tr><td>6</td><td>XX</td></tr> <tr><td>7</td><td>XX</td></tr> </tbody> </table>	Year	$D_{x,y}$	1	XX	2	XX	3	XX	4	XX	5	XX	6	XX	7	XX
Year	$D_{x,y}$																
1	XX																
2	XX																
3	XX																
4	XX																
5	XX																
6	XX																
7	XX																
Description of measurement methods and procedures to be applied:	The ECC will collect and record the date of installation of each SWH system installed under the CPA-XX. The proportion of days in year y is calculated based on the record of the date of installation of each SWH system and recorded in the database.																
QA/QC procedures to be applied:	-																
Any comment:	-																

Data / Parameter:	R_y
Data unit:	-
Description:	The proportion of SWH systems that are operational and in compliance with manufacture-required maintenance procedures in year y
Source of data to be used:	Database developed by the ECC
Value of data applied for the purpose of calculating expected emission reductions in section B.5	XX
Description of	The ECC will conduct an annual inspection to check the proper operation and

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 22

measurement methods and procedures to be applied:	in compliance with manufacturer-required maintenance procedures for the sampled SWH systems. The sample of the residences where the systems are installed will be selected by simple random sample method to meet 90/10 confidence/ precision following “Standard for sampling and surveys for CDM project activities and programme of activities”, version 02.0.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	I_v
Data unit:	-
Description:	Average annual technical grid losses during year y
Source of data to be used:	Electricity of Viet Nam (EVN)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	XX
Description of measurement methods and procedures to be applied:	The value shall be determined from recent data published by EVN. The ECC will collect the data from EVN.
QA/QC procedures to be applied:	-
Any comment:	-

SECTION C. Environmental analysis

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:

☒ Please tick if this information is provided at the PoA level. In this case, sections C.2. and C.4. need not be completed in this form.

Environmental analysis is undertaken at the PoA level since the impact of all CPAs will be similar. In addition, the relevant impacts are the ones from all the SWH systems installed under the PoA together rather than the impacts of a certain group of SWH systems of an individual CPA.

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

N/A

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 23

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

N/A

SECTION D. Stakeholders' comments

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

☒ Please tick if this information is provided at the PoA level. In this case, sections D.2. to D.4. need not be completed in this form.

The geographical boundary of the PoA is the south of Viet Nam. Each CPA consists of a group of SWH systems installed in a same year across the south of Viet Nam. The ECC determined that there would be no significant difference in the comments toward this project depending on the year of installation. Therefore, it is considered appropriate to carry out the local stakeholder consultation at PoA level.

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

N/A

D.3. Summary of the comments received:

N/A

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

N/A

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 24

Annex 1

CONTACT INFORMATION ON ENTITY/INDIVIDUAL RESPONSIBLE FOR THE SMALL-SCALE CPA

Organization:	The Energy Conservation Center of Ho Chi Minh City
Street/P.O.Box:	244 Dien Bien Phu St., District 3
Building:	
City:	Ho Chi Minh city
State/Region:	
Postfix/ZIP:	
Country:	Viet Nam
Telephone:	+84 8 932 2372
FAX:	+84 8 932 2373
E-Mail:	huynhkimtuoc@gmail.com
URL:	www.ecc-hcm.gov.vn
Represented by:	
Title:	Director
Salutation:	Mr.
Last Name:	Huynh
Middle Name:	Kim
First Name:	Tuoc
Department:	
Mobile:	
Direct FAX:	+84 8 932 2373
Direct tel:	+84 8 932 2372
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The CPA-XX will not receive any public funds that would be result of official development assistance from Parties included in Annex I to the Convention.

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 25

Annex 3

BASELINE INFORMATION

The data used for the Project's grid emission factor calculation conducted by Vietnamese DNA⁶ are as follows.

Table A3.2. Contribution of low-cost and must-run sources to overall power generation in Viet Nam

Year	2004	2005	2006	2007	2008	Average
Hydro power generation (MWh)	17,858,651	16,365,438	19,508,244	22,385,232	25,933,762	102,051,327
Total generation (MWh)	44,974,169	50,330,468	57,160,493	66,348,589	74,689,636	293,503,355
Rate of low cost/must-run sources (%)	39.71%	32.52%	34.13%	33.74%	34.72%	34.77%

Table A3.3. Electricity outputs and fuel consumptions of thermal power sources in 2006– 2008⁷

Power plant types	Fuel consumption (Coal:Kton, Oil:Kton, Gas:mm3)	Net electricity generated to the grid (MWh)	Emission (t CO₂)
2006			
Coal thermal	5,645.86	8,989,230	11,823,610
Turbine		26,542,978	12,479,578
Gas Turbine	5,743,235.28	18,838,764	12,244,651
Oil turbine	70.14	233,582	234,927
Recycled heat	0	7,470,632	0
Oil thermal	397.65	1,043,991	1,327,593
FO Diesel	16.60	80,000	51,642
DO Diesel	6.39	25,000	20,495
Imported electricity		937,000	0
Total		37,618,119	25,702,918
2007			
Coal thermal	6,386.09	9,836,548	13,272,897
Turbine		29,474,918	13,116,063
Gas Turbine	5,910,941.84	20,023,591	12,570,669
Oil turbine	163.27	557,880	545,394
Recycled heat	0	8,893,447	0
Oil thermal	614.06	1,834,409	2,046,368
FO Diesel	25.15	104,626	79,867
DO Diesel	9.16	42,000	29,088
Imported electricity		2,629,000	0

⁶ http://www.noccop.org.vn/Data/vbpq/Airvariable_ldoc_vnHe%20so%20phat%20thai.pdf

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 26

Total		43,921,501	28,544,283
2008			
Coal thermal	6,483.99	10,055,394	13,378,811
Turbine		33,857,135	14,716,799
Gas Turbine	6,839,114.84	22,396,231	14,535,266
Oil turbine	54.35	183,088	181,533
Recycled heat	0	11,277,816	0
Oil thermal	534.59	1,481,880	1,784,825
FO Diesel	22.48	90,465	71,385
DO Diesel	3.73	15,000	11,879
Imported electricity		3,220,000	0
Total		48,719,874	29,963,699
Total 2006-2008		130,259,494	84,210,900
OM			0.6465

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01**



NAME /TITLE OF THE PoA:
Installing Solar Water Heating Systems in the South of Viet Nam



CDM – Executive Board

page 27

Table A3.4. Calculation of BM emission factor in 2008

Power plant names	Year of operation	Fuel consumption (Coal:Kton, Oil:Kton, Gas:mm3)	Net electricity generated and delivered to the grid (MWh)	Emission (t CO ₂)
Set of 5 power units that started to supply electricity to the grid most recently				
A Vuong	2008	Hydro power	0	168,103.50
Tuyen Quang	2008	Hydro power	0	1,136,112.18
Dai Ninh	2008	Hydro power	0	1,145,108.50
Nhon Trach	2008	Gas	166.38	544,808.60
Ca Mau 1&2	2007	Gas	647.24	2,106,807.27
		Recycled heat		2,728,827.00
Total			7,829,812.02	
Set of power units that started to supply electricity to the grid most recently and that comprise 20% of the system generation				
A Vuong	2008	Hydro power	0	168,103.50
SROC Phu Mieng IDICO	2006	Hydro power	0	241,556.00
Se San 3A	2006	Hydro power	0	394,895.70
Tuyen Quang	2008	Hydro power	0	1,136,112.18
Dai Ninh	2008	Hydro power	0	1,145,108.50
Se San 3	2006	Hydro power	0	1,131,614.00
Quang Tri	2007	Hydro power	0	250,804.40
Uong Bi 2	2007	Coal	281,759	532,000.00
Na Duong	2005	Coal	532	627,930.00
Cao Ngan	2007	Coal	526	708,693.00
Formosa	2004	Coal	495	560,295.00
Nhon Trach	2008	Gas	166,38	544,808.60
Ca Mau 1&2	2007	Gas	647,24	2,106,807.24
		Recycled heat		2,728,872.00
Phu My 2,2	2004	Gas	1,159.75	4,141,980.00
Dam Phu My	2006	Gas	56.15	7,716.00
Cai Lan - Vinashin	2007	FO	22.48	90,465.01
Total			16,514,761.12	8,362,386.09
BM EF Calculation result				
Total Emission			8,362,386.09 (t CO ₂)	
Total Electricity generation to grid			16,514,761.12 (MWh)	
BM (2008)			0.5064 (t CO₂ /MWh)	

SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM
(CDM-SSC-CPA-DD) - Version 01



NAME /TITLE OF THE PoA:

Installing Solar Water Heating Systems in the South of Viet Nam

CDM – Executive Board



page 28

Annex 4

MONITORING INFORMATION

The monitoring information is described in section B.6.