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

CONTENTS

Annexes

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):

Installing Solar Water Heating Systems in the South of Viet Nam

Version 01
13 February 2009

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

Purpose of this programme of activities (PoA)

The purpose of this PoA is to install solar water heating (SWH) systems to households, kindergartens, and small hotels in the south of Viet Nam. The SWH systems will be systematically installed through a subsidy programme coordinated by the Energy Conservation Center of Ho Chi Minh City. The cost of the SWH systems will be subsidised as an incentive to encourage people to install SWH systems.

The goal of this PoA is to promote energy saving in the southern region of Viet Nam. Each CPA included in the PoA will install SWH systems in respective provinces. Using solar energy for water heating reduces demand for electricity and reduces the greenhouse gases (GHGs) associated with producing electricity from the national grid.

This project is a voluntary initiative coordinated by the Energy Conservation Center (ECC) of Ho Chi Minh City. The ECC was established in 2002 through a decision by the People's Committee of HCMC, aiming to improve energy efficiency, promote renewable energy, research and development and develop human resources. The ECC aims to reduce electricity consumption in the south of Viet Nam through the use of SWH systems supplying heated water. The ECC will coordinate this PoA and all CPAs under this PoA.

The ECC will promote the use of SWH systems by providing information regarding the economic and environmental benefits of SWH systems and explain the support structure of the subsidy programme and SWH system distributors. Under the programme, the ECC will receive applications from prospective users and select applicants who are eligible for the subsidy. Consumers will receive the subsidy from the ECC only after the power companies and the ECC have confirmed installation of the SWH system.

Background of this PoA

With the rapid growth of the economy in Viet Nam, electricity demand is increasing. The Vietnamese Government estimated the annual growth in electricity demand to be about 11% from 2005 to 2010. However, actual electricity consumption has been increasing more than the Government's estimation. The Vietnamese Government is promoting energy saving and the use of renewable energy in order to ensure a stable electricity supply. In the south of Viet Nam population growth and electricity demand are expected to increase, especially in Ho Chi Minh City, the biggest commercial city in Viet Nam, and industrial zones developed around Ho Chi Minh City.

About half of the electricity distributed by Electricity of Viet Nam (EVN) is sold to households. Along with the rapid economic growth, home electronics, such as televisions, air-conditioners and electronic water heaters have become widely used among Vietnamese people. Especially in urban areas, electric water heaters are commonly used for providing hot water for showers and the electricity consumed for water heating accounts about 15% of the total electricity consumption of one family. Therefore energy saving measures for electricity consumption from water heating are important tasks in Viet Nam.

Contribution to the sustainable development of the host country

This PoA will contribute to sustainable development of Viet Nam in 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 proposed PoA will reduce energy consumption for water heating for household use in the south of Viet Nam and help secure the electricity supply required for the country's continued economic growth.

Environmental dimension – The PoA reduces electricity consumption and thereby reduces 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 use of SWH systems, the ECC will communicate the economic and environmental benefits of SWH systems. This publicity will widely 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. Coordinating/managing entity and participants of SSC-POA:

The coordinating entity for this PoA is the Energy Conservation Center of Ho Chi Minh City

The project participants being registered in relation to the PoA are as follows:

Name of Party involved ((host) indicates a host party)	Private and/or public entities Project participants	The Party involved wishes to be considered as project participant
Viet Nam (host)	The Energy Conservation Center of Ho Chi Minh City	No

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

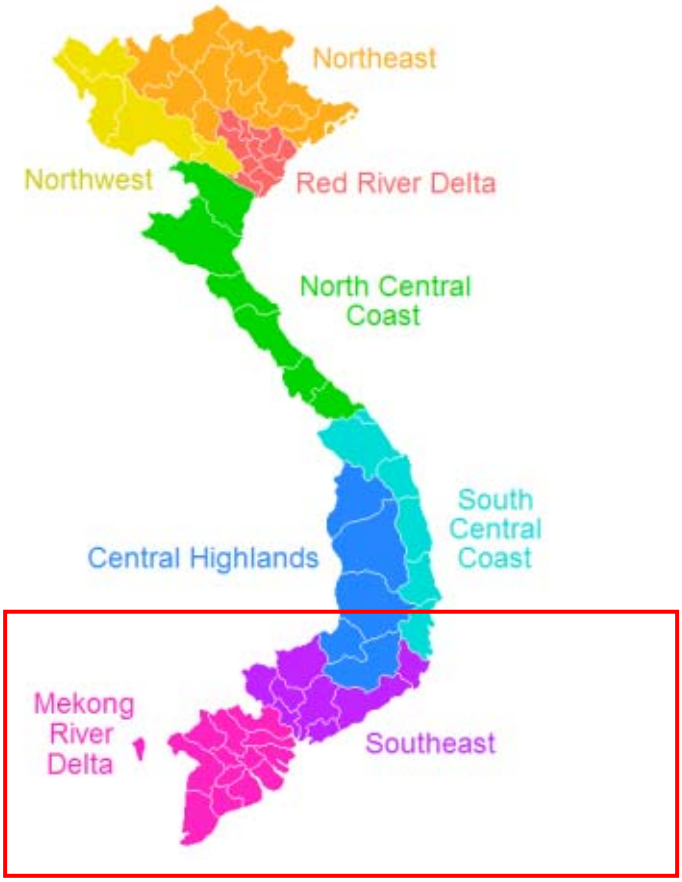
A.4.1. Location of the programme of activities:

A.4.1.1. Host Party(ies):

Socialist Republic of Viet Nam

A.4.1.2. Physical/ Geographical boundary:

The geographical boundary of the project is the South of Viet Nam. It is composed of Ho Chi Minh City (HCMC) and 21 provinces (Ninh Thuan, Binh Thuan, Lam Dong, Binh Duong, Binh Phuoc, Ba Ria Vung Tau, Dong Nai, Long An, Tien Giang, Ben Tre, Tay Ninh, Hau Giang, Bac Lieu, Can Tho, Ca Mau, Dong Thap, An Giang, Kien Giang, Vinh Long, Tra Vinh, Soc Trang).



South of Viet Nam
Image courtesy of Wikipedia

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:

In a typical CPA, SWH systems will be installed in the south of Viet Nam. SWH systems employ technology of heating water using solar energy. The ECC as the coordinating entity of a typical CPA will enhance installation of SWH systems into households, kindergartens, and small hotels in provinces in the south of Viet Nam by providing subsidies to consumers. In order to participate in the programme, consumers must purchase SWH systems from distributors who are officially registered in the programme.

Several types of SWH systems will be installed under a typical CPA. SWH systems installed in a typical CPA will be composed of solar collectors and tanks for the heated water. Two types of solar collectors will be available under a typical CPA, flat plate and evacuated tube collectors . The average surface of the solar collectors is 2.2m^2. The capacity of the SWH system hot water tanks installed under a typical CPA should be more than 180 litres. All SWH systems will be passive systems without a forced circulation system or auxiliary heat source, so that all systems installed under a typical CPA do not consume energy sources other than solar energy.

SWH system distributors who are officially registered in this programme will determine the optimum placement of the systems at each building to collect enough solar radiation and install the systems.

Figure 1.
SWH system with evacuated tube solar collectors

Figure 2.
SWH system with flat plate solar collectors

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

Criteria for inclusion of a typical CPA in the PoA include:

- A CPA will install new solar water heater (SWH) systems in households, kindergartens and small hotels.
- A CPA is in the south of Viet Nam.
- A CPA will be coordinated by the ECC.
- The SWH systems under a CPA are installed by SWH system distributors certified by the ECC
- The SWH systems under a CPA are registered under the installation program of the ECC.

- The SWH under a CPA has a tank capacity of at least 180L.
- The CPA should apply the same technology and baseline and monitoring methodology, AMS-I.C., as other CPA of the registered PoA. Versions of the baseline and monitoring methodology may change according to most recent guidance provided by the CDM Executive Board.
- The CPA should apply the same baseline scenario as other CPA of the registered PoA, so the energy baseline will differ only according to number of units included in a CPA.

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):

Viet Nam is experiencing rapid economic growth and the electricity demand is growing faster than the forecasted supply. With total electricity consumption forecast to increase by 11% within the period of 2005-2010, energy saving and improvement of energy efficiency is necessary to ensure a stable electricity supply.

The proposed PoA is a voluntary coordinated action with the goal to promote energy saving in the south of Viet Nam by installing a large number of SWH systems. There are no national laws requiring reduced electricity consumption via the installation of SWH systems.

The proposed project will be not implemented in the course of regular business due to the following barriers:

Investment barrier

The ECC will subsidize USD50 of the USD400-500 approximate cost to consumers of purchasing and installing one SWH system to enhance the installation of SWH systems. However, because of budgetary constraints, the ECC needs to propose to the People's Committee of Ho Chi Minh City and the Ministry of Industry and Trade to allocate a budget to continue the programme.

The revenues from the sale of CERs will be used to subsidize the installation of additional CPAs, as well as fund the promotional campaign for using SWH systems. Without CDM, it will be difficult for the ECC, to continue installation of the SWH systems and implement additional CPAs in the south of Viet Nam. Therefore, it will be difficult to implement the project without CDM.

Technical barrier

SWH systems rely on optimum placement in order to collect enough solar radiation for heating the water. Care must be taken that there is no shade to block the sunlight shining on the collector, and that the collector is tilted at the appropriate angle for receiving the maximum solar heat. Also, pipe laying work is required to carry heated water from where the SWH systems are installed to the bathroom of the buildings. While small size electric water heaters can be installed easily and their use is widespread, trained staff is necessary to determine proper installation of the SWH systems and to provide the necessary maintenance and after care support.

All SWH systems installed under each CPA in the PoA will be installed by SWH system distributors certified by the ECC. The SWH system distributors will be required to report to the ECC about any problems which occur in the systems included in a CPA under the PoA. Especially for maintenance, it is

difficult to ensure that reliable maintenance and after care service is offered by SWH system distributors for a long term without supervision by the ECC under the PoA.

Barriers due to prevailing practice

Current practice in Viet Nam is to purchase and install an electric hot water heater. Electric heaters are much cheaper and easy to install than SWH systems. It is difficult to change this current practice without raising awareness about the environmental and economic benefits of SWH systems and offering a cost incentive to people in Viet Nam. In order for Viet Nam to achieve the environmental benefits that SWH systems offer it is necessary to implement a program to coordinate their installation on a large scale and offer a cost incentive to the public to participate.

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

A.4.4.1. Operational and management plan:

The operational and management arrangements for the implementation of the PoA will be established by the coordinating/ managing entity, the ECC. The ECC is the sole coordinating entity of this PoA and also all CPAs under the PoA. The ECC will cooperate with registered SWH system distributors and power companies to ensure the proper installation and operation of SWH systems and collection of monitoring data. The ECC will provide subsidies to people who purchased SWH systems only after a SWH system distributor and the power company have confirmed proper installation and operation of the SWH system. SWH system users are required to report any problem with a SWH system to a responsible SWH system distributor. The SWH system distributor will report to the ECC about the problem with the SWH system and its treatment to ensure the number of systems in operation.

A database will be set up the by the ECC for the PoA as well as each CPA under the PoA. The database will include the following information for each CPA under the PoA, among others:

- Location and geographic boundaries of a CPA
- Starting date and verification status of a CPA
- Emission reductions of a CPA
- Monitoring data for each SWH system registered under a CPA, as further discussed in Section E.7.2.

The geographic location of each CPA and all SWH systems registered in one CPA will be uniquely defined and recorded. The ECC will ensure that any SWH systems in a new CPA have neither already been registered as a CDM project activity nor as a CPA of another PoA.

A.4.4.2. Monitoring plan:

The coordinating/ managing entity, the ECC, will verify each CPA individually. A database will be set up by the ECC for each CPA and the PoA. As discussed previously in Section A.4.1., the database includes information on geographic location and CDM status for each CPA under the PoA, to ensure no double accounting. The monitoring plan for each CPA under the PoA is discussed in Section E.7.

The ECC will keep a record of all monitoring data. The figure in Annex 4 shows the monitoring structure for a typical CPA.

The monitoring procedure for a typical CPA is explained below:

1) The ECC will keep a record of the number, location, type, and owner of all SWH systems installed. The owners of the SWH systems are required to report to distributors to fix systems if they have any problems. SWH system distributors need to report any information on system problems and the number of days that systems do not operate. Then, the ECC will add information on the systems which have problems into their database to keep an up-to-date record of all operating systems.

2) The ECC will also collect data on the sunny hours per day from the Meteorological Center in each province where a CPA is located and then calculate the sunny hours per year.

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

- Location of SWH system registered under a CPA;
- Name of the SWH system owner;
- Installation date of the SWH system;
- SWH system distributor and technical specifications of the SWH system;
- SWH system serial number;
-Dates when the system stops operation and restarts operation;
-The reason for any system problems.

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

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

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

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

01 January 2009

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

28 Years

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:

Vietnamese law does not require an environmental impact assessment (EIA) to be completed for solar water heating (SWH) system installation.

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

There are not expected to be any environmental impacts due to the implementation of the project.

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),:

Vietnamese law does not require an environmental impact assessment to be conducted for a typical CPA included in the PoA as per Section C.1 above.

SECTION D. Stakeholders' comments

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

1. Local stakeholder consultation is done at PoA level ☑

The geographical boundary of the project is the south of Viet Nam. Based on collected data, the ECC determined that there would be no significant difference in the comments toward this project between the provinces in the south of Viet Nam encompassed by the Project boundary and thus invited local stakeholder comments at the PoA level.

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

A pilot project for the installation of SWH systems was implemented in 2008. The pilot project was promoted in print and broadcast media. Respondents who registered under the pilot project were interviewed after the installation of SWH systems in their respective households. The ECC staff randomly interviewed sixty people who came to the ECC office to receive subsidies from the ECC.

D.3. Summary of the comments received:

Respondents were satisfied with the installation of SWH systems in their houses. 97% of respondents commented that their electricity cost was reduced after installing SWH systems and they were happy about this saving. More than 90% of respondents mentioned that the amount of hot water provided by SWH systems was enough for their needs. Comments indicating the safety and convenience of the SWH systems were also received.

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

No negative comments were received, thus no further action was deemed necessary.

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:

All CPAs in this PoA use baseline and monitoring methodolgy AMS-I.C. "Thermal energy for the user with or without electricity", Version 13. Versions of the baseline and monitoring methodology may change according to the most recent guidance provided by the CDM Executive Board.

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

The CPAs included in this PoA comprise renewable energy technologies that supply individual households with thermal energy that displaces fossil fuels. The aggregate energy savings of one CPA of the PoA is less than 45 MW_{th}.

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

The gas reduced through this CPA is CO_2. The CPA will reduce electricity consumption by providing energy via solar water heating (SWH) systems. The reduced electricity demand thereby reduces the amount of CO_2 produced by fossil fuel combustion at the electricity grid.

	Source	Gas	Included?	Justification/Explanation
Baseline	Electricity consumption/ Heat generation	CO_2	Included	Water heating consumes electricity, which had been sourced from the public grid.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project	Heat generation	CO_2	Excluded	Heat will be displaced by solar energy, which is a renewable source. According to AMS-I.C., this can be excluded.
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.

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

To determine the baseline scenario, the following plausible alternatives to the CPA are identified as:

- Scenario 1: Implementation of the proposed project activity without CDM, or
- Scenario 2: Continuation of the current practice of water heating using electricity.

There are no national laws regarding which type of technology type should be used to produce heated water in households, kindergartens and small hotels. As will be discussed in the following Section E.5.1., the installation of SWH systems in the south of Viet Nam faces considerable barriers, and will not be implemented in the course of regular business.

Identified barriers include:

Investment barriers due to the costs of providing the subsidy to consumers of the SWH systems;

Technical barriers arising from installation of the SWH system, ongoing maintenance and after care service; and

Common practice barriers due to lack of public knowledge of the economic and environmental benefits provided by SWH systems..

Due to these barriers, Scenario 1: Implementation of the CPA without CDM, is not considered a feasible option and the roll-out of SWH systems will not occur without considerable investment.

The remaining alternative the continuation of the current practice of heating water through the use of electric heaters, faces no such barriers. As such the baseline scenario is therefore the situation where water for household would be heated through the use of electric heaters in the absence of a CPA.

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:

Although Viet Nam recognizes the need of energy saving to ensure a future stable, electricity supply, it is difficult to implement the installation of SWH systems without the project being implemented as a CPA and being included in a registered PoA due to the following barriers:

A typical CPA will be not implemented in the course of regular business due to the following barriers:

Investment barrier

The ECC will subsidize USD50 of the USD400-500 approximate cost to consumers of purchasing and installing one SWH system to enhance the installation of SWH systems. Because ECC's budget is limited and not adequate enough to provide subsidies for all systems under a typical CPA, the ECC needs to propose to the People's Committee of Ho Chi Minh City and the Ministry of Industry and Trade to allocate a budget to continue the programme.

The revenues from the sale of CERs will be used to subsidize the installation of additional SWH systems, as well as fund the promotional campaign for using SWH systems. Without CDM, it will be difficult for ECC, the coordinating entity, to continue installation of a large number of SWH systems under a typical CPA.

Technical barrier

SWH systems rely on optimum placement in order to collect enough solar radiation for heating the water. Care must be taken that there is no shade to block the sunlight shining on the collector, and that the collector is tilted at the appropriate angle for receiving the maximum solar heat. Also, pipe laying work is required to carry heated water from where the SWH systems are installed to the bathroom of the buildings. While small size electric water heaters can be installed easily and their use is widespread, trained staff is necessary to determine proper installation of the SWH systems and to provide the necessary maintenance and after care support.

Because there are various SWH system distributors in Viet Nam, it is difficult to ensure that all distributors will provide the necessary maintenance and after care support for a long term. Under a typical CPA, consumers must purchase SWH systems from distributors who are officially registered in a program. The ECC will supervise the proper installation and maintenance service of the distributors as a coordinating entity of a typical CPA. Without a typical CPA, it will be difficult to secure the continuous customer service of the SWH system distributors.

Barriers due to prevailing practice

Current practice in Viet Nam is to purchase and install an electric water heater. Electric heaters are cheaper and easier to install than SWH systems. People will not purchase and install SWH systems without information of the environmental and economic benefits of SWH systems as well as a cost incentive.

Faced with these investment, technical, and common practice barriers, a typical CPA will not be carried out in the course of regular business and is therefore considered additional.

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

Future SSC-CPA should demonstrate additionality based on the following criteria:

- No national and local laws and regulations requiring use of SWH systems.
- The proposed SSC-CPA requires the financial resources leveraged registration as a CPA under the registered PoA.
- The proposed SSC-CPA requires the technical assistance of the ECC in the installation and maintenance of the SWH systems.
- The proposed SSC-CPA demonstrates that the use of SWH systems is not common practice within the CPA boundary.

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:

A typical CPA is eligible as a small scale project category AMS-I.C. "Thermal energy with or without electricity" (Version 13). The baseline and monitoring methodology of AMS-I.C. (Version 13) are applied for a typical SSC-CPA. Versions of the baseline and monitoring methodology may change according to the most recent guidance provided by the CDM Executive Board.

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

Emission reductions

The emission reductions counted for a typical CPA will be the electricity saved by using SWH systems, instead of electricity imported from the grid for heating water used by consumers.

$$ER_y = BE_y = EG_y \times EF_{EL,y} \quad (1)$$

Where:

Parameter	Value	Unit	Description
ER_y		(tCO_2e /yr)	Emission reductions in year *y*
BE_y		(tCO_2e /yr)	Baseline emissions from electricity displaced by a SSC-CPA during the year *y*
EG_y		(MWh /yr /unit)	Quantity of energy displaced by a SSC-CPA during the year *y*
$EF_{EL,y}$	0.520	(tCO_2e /MWh)	Emission factor for electricity grid in year *y*

Energy baseline

The considered energy baseline will be the electricity consumed from the grid, which would be saved by installing the SSC-CPA SWH systems, is as follows:

$$EG_y = N \times EC_{y,BL} = N \times [m \times d \times 4.186 \times (T_2 - T_1)] / 3{,}600{,}000 \quad (2)$$

Where:

Parameter	Value	Unit	Description
N		[units]	Number of devices
$EC_{y,BL}$		(MWh /yr /unit)	Electricity displaced per unit of device under a SSC-CPA in the year y
m	180	(kg /d)	Volume of water consumed per day
d	365	(d /yr)	Effective operating days per year
	4.186	(kJ /kg /°C)	Specific heat capacity of water
T_2	60	(°C)	Temperature of water after heating
T_1	28	(°C)	Temperature of water before heating
	3,600,000	(kJ /MWh)	Conversion factor

$EC_{y,BL}$ = 2.44 (MWh /yr /unit)

The volume of water consumed is based on the tank capacity of the SWH; 180(kg/d) is the minimum capacity of SWH systems included in this CPA. The inlet temperature of water is given by the local water supply company. The outlet temperature of water was calculated using the average daily solar radiation, and energy conversion efficiency of the solar collectors of SWH systems.

Grid emission factor

Emission factor of the connected grid is calculated using AMS I.D. (Version 13). The baseline emission factor is calculated as the combined margin, consisting of the combination of the operating margin and the build margin factors calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" as follows:

Step 1. Identify the relevant electric power system

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

Step 2. Select an operating margin (OM) method

As no dispatch data is available and must-run/low cost resources constitute less than 50% of total grid generation over the past 5 years, the simple OM method is used (See table A3.1 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 fuel consumption and net electricity generation of each power plant/unit (Option A). The following formula is used to calculate Simple OM:

$$EF_{grid,OMsimple,y} = \frac{\sum_{i,m} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{\sum_{m} EG_{m,y}} \quad (3)$$

Where:

Parameter	Unit	Description
$EF_{grid,OMsimple,y}$	(tCO_2e /MWh)	Simple operating margin CO_2 emission factor in year y
$FC_{i,m,y}$	(kt)	Amount of fuel type *i* consumed by power plant/unit *m* in year *y*
$NCV_{i,y}$	(TJ/kt)	Net calorific value (energy content) of fossil fuel type *i* in year *y*
$EF_{CO2,i,y}$	(tCO_2e /TJ)	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)
$EG_{m,y}$	(MWh)	Net electricity generated and delivered to the grid by power plant/unit *m* in year *y* (MWh)
m		All power plants/units serving the grid in year *y* except low-cost/must-run power plants/units
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 available official data on fuel consumption and electricity generation for each plant connected to the Vietnamese national grid in 2005-2007. All data is summarized in Table A3.2 in Annex3.

The "Operating Margin" emission factor is calculated as:

EF_{OM} = 0.594 tCO_2/MWh

Step 4. Identify the cohort of power units to be included in the build margin

For the CPA, 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 this CPA.

Step 5. Calculate the Build margin emission factor

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

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (4)$$

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 proposed CPA, Option 1 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 A3.3 in Annex 3.

The build margin emission factor is calculated as:

EF_{BM} = 0.446 tCO_2/MWh

Step 6. Calculate the combined margin baseline emission factor

The combined margin emission factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (5)$$

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:

$EF_{EL,y}$ = 0.520 tCO_2/MWh

Emission reductions per system are calculated as follows:

ER_y = **2.44 (MWh/yr/unit)** × **0.520 (tCO_2e/MWh)**
= **1.27 (tCO_2e /yr /unit)**

Project emissions

As the heat is sourced from a renewable resource, there are no project emissions from a CPA.

Leakage

There is no leakage from a CPA.

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

Data / Parameter:	**$EF_{EL,y}$**
Data unit:	(tCO_2/MWh)
Description:	Emission factor for electricity generation for source *k* in year *y*
Source of data used:	Calculated based on the most recent data.
Value applied:	0.52
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 13). A combined margin is selected, and the simple OM method is applied. For OM, ex-ante option of Step 2 and Option (A) of Step 3 of the Tool are selected for the calculation. For BM, Option 1 of Step 4 is selected. See Annex 3 for details.
Any comment:	N/A

Data / Parameter:	***T_1***
Data unit:	(°C)
Description:	Inlet water temperature
Source of data used:	Local Water Supply Company
Value applied:	28
Justification of the choice of data or description of measurement methods and procedures actually applied :	The ECC will collect the data of an average temperature of tap water supplied by local water company.
Any comment:	---

Data / Parameter:	***T_2***
Data unit:	(°C)
Description:	Outlet water temperature
Source of data used:	Calculated based on available solar radiation and SWH efficiency.

Value applied:	60
Justification of the choice of data or description of measurement methods and procedures actually applied :	This value is calculated based on historical solar radiation data and SWH system efficiency.
Any comment:	---

Data / Parameter:	***M***
Data unit:	Kg
Description:	Volume of hot water consumed per day
Source of data used:	The ECC
Value applied:	180
Justification of the choice of data or description of measurement methods and procedures actually applied :	The ECC will collect and record the tank size of each installed SWH. A typical CPA includes only systems over 180 liters in capacity; 180 liters is a conservative estimation.
Any comment:	---

Data / Parameter:	***d***
Data unit:	(d /yr)
Description:	Operating days per year
Source of data used:	The ECC
Value applied:	365
Justification of the choice of data or description of measurement methods and procedures actually applied :	Once a SWH system is installed, it will operate everyday. The ECC will monitor whether the system is operating or not.
Any comment:	---

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

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

Data / Parameter:	***N***
Data unit:	[units]
Description:	Number of devices
Source of data to be used:	The ECC
Value of data applied for the purpose of calculating expected	

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Directly determined in the course of installing SWH systems included in a CPA. The ECC will collect and record the number of systems installed under a CPA.
QA/QC procedures to be applied:	Will be cross-checked against other relevant internal records of the ECC.
Any comment:	---

Data / Parameter:	Sunny hours
Data unit:	(hr /yr)
Description:	Effective sunny hours per year
Source of data to be used:	Local Meteorological Center
Value of data applied for the purpose of calculating expected emission reductions in section B.5	---
Description of measurement methods and procedures to be applied:	The effective sunny hours per year will be calculated from local meteorological data.
QA/QC procedures to be applied:	Will be cross-checked against SWH system usage data to determine if available solar radiation is enough to heat water to the desired temperature.
Any comment:	This value is not used for ER calculation.

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

The ECC will keep all monitoring data. The figure in Annex 4 shows the monitoring structure for a CPA. The monitoring methodology AMS-I.C. "Thermal energy for the user with or without electricity" is applied for a CPA. The methodology consists of the following:

If the emissions reductions per system are less than five (5) tonnes per year:

- Recording annually the number of systems operating (evidence of continuing operation, such as on-going rental/lease payments could be a substitute); and
- Estimating the annual hours of operation of an average system, if necessary using survey methods. Annual hours of operation can be estimated from total output and output per hour if an accurate value of output per hour is available.

The monitoring procedure for a CPA is explained below:

1) The ECC will keep a record of the number, location, type, and owner of all SWH systems installed. The owners of the SWH systems are required to report to distributors to fix systems if they have any problem. SWH system distributors need to report any information on system problems and the number of

days that systems do not operate. Then, the ECC will add information on the systems which have problems into their database to keep an up-to-date record of all operating systems.

2) The ECC will also collect data on the sunny hours per day from the Meteorological Center in each province where a CPA is located and then calculate the sunny hours per year.

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

- Location of the SWH system registered under a CPA;
- Name of the the SWH system owner;
- Installation date of the SWH system;
- SWH system distributor and technical specifications of the SWH system;
- SWH system serial number;
-The dates when system stops operation and restarts operation;
-The reason for any system problems.

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)

The baseline study was completed on 13 February 2009 by:

Clean Energy Finance Committee
Mitsubishi UFJ Securities Co., Ltd.
Mitsubishi Building
2-5-2 Marunouchi, Chiyoda-ku,
Tokyo, 100-0005, Japan

watanabe-hajime@sc.mufg.jp

Annex 1

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

Organization:	The Energy Conservation Center (ECC), Ho Chi Minh City
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Represented by:	
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Salutation:	Ms.
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

Table A3.1. Rate of low cost/must-run sources based on generation

Year	2003	2004	2005	2006	2007	Average
Hydro power generation (GWh)	19,033	17,979	16,437	19,573	22,178	19,040
Total generation (GWh)	40,636	46,800	53,407	60,489	68,725	54,011
Rate of low cost/must-run sources (%)	46.84	38.42	30.78	32.36	32.27	35.25

Table A3.2. Electricity outputs and fuel consumptions of thermal power sources in 2005– 2007[1]

Fuel Type		2005	2006	2007
Coal	**GWh**	9,446	10,808	11,415
NCV = 22.19 TJ/kt*	**kt**	4,857	5,643	5,896
CO_2EF = 94.6 tCO_2/TJ –IPCC-2006	**kt CO_2**	10,083	11,581	12,032
Gas Turbine (Gas)	**GWh**	24,031	26,786	28,807
CO_2EF = 54.3 tCO_2/TJ –IPCC-2006	**TJ**	179,472	204,133	212,945
	kt CO_2	9,745	11,084	11,563
Diesel Oil	**GWh**	482	261	601
NCV = 42.7 TJ/kt	**kt**	136	73	169
CO_2EF = 72.6 tCO_2/TJ – IPCC-2006	**kt CO_2e**	422	228	523
Fuel Oil	**GWh**	2,638	2,095	3,094
NCV = 41.45 TJ/kt	**kt**	722	574	846
CO_2EF = 75.5 tCO_2/TJ –IPCC-2006	**kt CO_2e**	2,259	1,797	2,649
Imported electricity	**GWh**	373	966	2,630
Total CO2 emission from Viet Nam grid	**kt CO_2e**	**22,509**	**24,691**	**26,766**
Total thermal electricity output generated	**GWh**	**36,970**	**40,916**	**46,547**

*22.19 TJ/kt are used for all coal power plants except for the following:
Na Duong: 14.65
Cao Ngan: 18.84
Formosa: 25.96

[1] Sources: Recapitulative Report on the operation of Viet Nam National Electricity System in Year 2006, EVN/National Electricity system Dispatching Center - Department for Electricity System Operation, Hanoi, January 2007

Table A3.3. The power plant capacity additions in the electricity system that comprise 20% of the system generation (in GWh) and that have been built most recently[2]

No	Plant name	Commissioning year	Capacity (MW)	Output (GWh)	Energy type	Emission (kt CO_2)
1	Quang Tri	2007	64	64	Hydro	-
2	Ca Mau	2007	720	691	Gas	244
3	Cai Lan (Quang Ninh)	2007	40	81	Fuel oil	71
4	Se San 3a	2007	108	345	Hydro	-
5	Srok Phu Miêng	2006	51	252	Hydro	-
6	Cao Ngan*+(IPP) PC1	2006	100	445	Coal	442
7	Uong Bi 2	2006	300	520	Coal	458
8	Se San 3	2006	260	1,113	Hydro	-
9	Dam Phu My (IPP) PC2	2005	150	150	Gas	58
10	Na Duong*+(IPP) PC1	2004	110	744	Coal	763
11	Fosmosa	2004	150	1,113	Coal	864
12	Phu My 4	2004	450	3,142	Gas	1,411
13	Phu My 2-2	2004	720	5,004	Gas	1,937
14	Can Don	2003	259	361	Hydro	-
	Total			**14,025**		**6,248**

[2] Sources: Recapitulative Report on the operation of Viet Nam National Electricity System in Year 2006,

EVN/National Electricity system Dispatching Center - Department for Electricity System Operation, Hanoi, January 2007

Annex 4

MONITORING INFORMATION

CPA monitoring information is found in Section E.7. The monitoring structure is of a CPA is shown as follows: