	<p align="center"><b>Component project activity design document form</b> (Version 09.0)</p>	
<p align="center"><b>BASIC INFORMATION</b></p>		
<b>Title of the CPA</b>	Installation of Solar Home Systems in Bangladesh (01/09/2013 to 30/04/2014) by IDCOL <sup>1</sup>	
<b>Scale of the CPA</b>	<input type="checkbox"/> Large-scale <input checked="" type="checkbox"/> Small-scale	
<b>Version number of the CPA-DD</b>	05	
<b>Completion date of the CPA-DD</b>	16/08/2021	
<b>Title and UNFCCC reference number of the registered CDM PoA</b>	Title of PoA: Installation of Solar Home Systems in Bangladesh UNFCCC Reference Number: PoA 2765	
<b>Title and reference number of the corresponding generic CPA</b>	Title: Installation of Solar Home Systems in Bangladesh (01/09/2013 to 30/04/2014) by IDCOL Reference Number: 2765-P1-0013-CP1	
<b>Coordinating/managing entity</b>	Infrastructure Development Company Limited (IDCOL)	
<b>Host Party</b>	Bangladesh	
<b>Applied methodologies and standardized baselines</b>	Methodology: AMS-I.A: Electricity generation by the user --- Version 17. EB 103, Annex 05. Standardize Baseline: Not Applicable	
<b>Sectoral scopes</b>	Sectoral Scope: 1 Energy industries (renewable / non-renewable sources)	
<b>Estimated amount of annual average GHG emission reductions</b>	52,496	

<sup>1</sup> [https://cdm.unfccc.int/ProgrammeOfActivities/cpa\\_db/6UW7KQP0RZGAHSO5EIXB9YV382M1F4/view](https://cdm.unfccc.int/ProgrammeOfActivities/cpa_db/6UW7KQP0RZGAHSO5EIXB9YV382M1F4/view)

## SECTION A. Description of component project activity (CPA)

### A.1. Purpose and general description of CPA

The project activity (CPA) is a bundle of approximately 273,333 units of Solar Home Systems (SHS), with various typical capacities ranging from 20 Wp to 130 Wp, installed in rural regions of Bangladesh that are not connected to the electricity grid. Electricity is generated by the SHS on site by the end user for own use. Households<sup>2</sup> were previously using kerosene lamps for lighting and batteries for running television sets and other small appliances. The batteries were charged from time to time at the local village stores by small diesel generators. The CPA is a voluntary initiative undertaken by Infrastructure Development Company Limited (IDCOL) through its Participating Organizations (POs).

IDCOL is implementing the rural electrification programme through the POs to provide electricity to users in off-grid, remote and rural areas with SHS. These SHS users currently have no access to grid-connected electricity and use kerosene for lighting or batteries charged by diesel generators for electrical devices. The proposed SHS program involves providing:

- Soft credit through instalments to make SHS attractive<sup>3</sup>
- Intense grassroots promotion through demonstrations, fairs, meetings at the local level, etc.
- Community involvement and social acceptance of SHS and
- Free operation & maintenance service for three years after SHS installation. After this period, further service is obtained, upon payment of a minimal charge.

In the absence of the proposed CPA, the most likely alternative is that households would have continued using kerosene as fuel for their lighting application and domestic batteries, charged at local stores from diesel generators for other appliances such as TVs. Thus kerosene consumption for lighting and diesel consumption for charging batteries for running low power electrical appliances is avoided and the greenhouse gas (GHG) emissions are reduced from the avoidance of burning fossil fuels. The CPA generates an estimated 367,472 tCO<sub>2e</sub> emission reductions during 7 years of this second crediting period.

The proposed CPA contributes to the following sustainable development objectives in Bangladesh:

- The introduction of SHS reduces dependency on imported fossil fuels such as kerosene and diesel in Bangladesh;
- The proposed CPA helps to create new business and job opportunities related to operation and maintenance of SHS. For example, PO / IDCOL trained local technicians provides maintenance and repair services to the SHS users;
- The increase in reliability of electricity supply promotes the development of micro-enterprises. The improved lighting quality from SHS enables longer working hours and support higher income-generation. Tailoring businesses, convenience stores, cafés and restaurants can serve more clients by working longer business hours. New income opportunities, such as mobile phone-charging services and renting time on mobile phones, are also generated. These have a positive socio- economic impact; and

<sup>2</sup> As households are the predominant SHS consumers, the term "households" is used in the PoA and CPA. Reference to households in this PoA and the CPAs does not preclude other users from taking part in the program.

<sup>3</sup> Program and SHS financing: GTZ and KfW have provided a grant to the SHS program to buy down the cost of each SHS by \$40. In addition, upon installation of an SHS, the technician/ PO undertaking the installation receives an installation fee from the GTZ/KfW grant and the World Bank has provided an IDA loan to Government of Bangladesh which is lent via IDCOL, to the various POs. The POs extend credit to the SHS user at 6%, install and maintain the SHS. The SHS user is required to provide a down payment of 10% - 25% of the cost of the SHS which is repaid in up to 5 years over equal instalments.

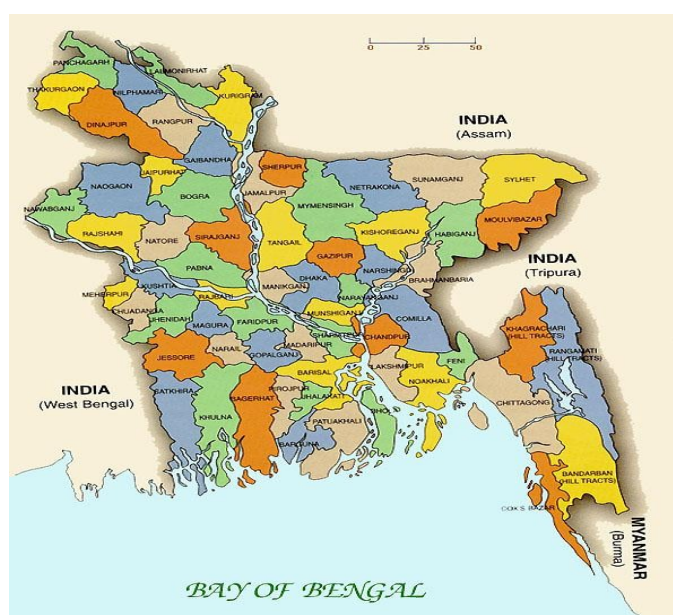
- SHS users have healthier home and work environments. Since SHS replaces the conventional soot-producing lamps, they significantly reduce indoor air pollution thus, reducing the incidence of respiratory diseases, eye ailments, etc. This is expected to reduce the health-care expenditures by the end users.

## A.2. Location of CPA

The boundary of this CPA covers the entire of Peoples' Republic of Bangladesh. IDCOL is responsible for maintaining a comprehensive data base which provides a unique identification number for each SHS consumer / installation. This ensures that all SHS installed within this CPA can be distinguished from any other CPA which may be registered.

Peoples' Republic of Bangladesh is bound by the following coordinates:

Latitude : +20.40° and +27.00° N  
Longitude : +87.50° and +92.55° E



## A.3. Technologies/measures

Description of technology/measure:

The systems included in this CPA introduces SHS of various capacities that comprises of:

- Solar module (20 - 130 Wp)
- Battery
- Charge controller
- Fluorescent tube lights with special electronic ballasts
- Mounting structure
- Installation kits
- Cables and connecting devices

The solar photo voltaic (PV) module directly converts solar energy into electrical energy. This electrical energy is stored in a battery. The battery is charged during daytime and the stored energy is supplied to the loads (i.e., lights, television set, etc.) during day and night times. A charge controller is used in- between the PV module and the battery to protect the system from attaining

an overcharged or undercharged condition. All SHS to be installed in this project comprises of the same technical elements.

The capacity of individual SHS which are installed varies according to the consumer's choice and demand.

The typical connected loads of SHS ratings are given below in table 1:

**Table 1: Connected loads to SHS systems**

Connected Load	SHS Rating, Wp											
	20, 21, 30	35, 40	45	50, 55	60, 65	70, 74, 75	80, 85, 90	100, 120	125, 130	140	160	
CFL Lights												
Nos.	2	3	3	4	5	6	8	10	11	12	13	
Wattage/light	6	6	6	6	6	6	6	6	6	6	6	
Hours per day	4	4	4	4	4	4	4	4	4	4	4	
TV - Black & White												
Nos.	0	0	1	1	1	1	1	1	1	1	1	
Wattage	10	10	10	10	10	10	10	10	10	10	10	
Hours per day	3	3	3	3	3	3	3	3	3	3	3	
Mobile Charger												
Wattage	3	3	3	3	3	3	3	3	3	3	3	
Hours per day	4	4	4	4	4	4	4	4	4	4	4	

The technical specifications of SHS units proposed to be installed under the programme are as follows:

**Table 2. Technical specifications of the SHS panels**

Parameter	Panel rating, W <sub>p</sub>										
	20	21	30	35	40	45	50	55	60	65	70
Rated peak power, W <sub>p</sub>	20	21	30	35	40	45	50	55	60	65	70
Type (a-Si, Crystalline Si, etc.)	Cryst Si	Cryst Si	Cryst Si	Cryst Si	Cryst Si	Cryst Si	Cryst Si	Cryst Si	Cryst Si	Cryst Si	Cryst Si
Useful energy (Ah/day)	5.80	5.85	8.28	12.3	11.6	12.01	14.1	14.80	17.2	18.85	18.85
Open circuit voltage (V)	21.9	21.7	21.5	21.7	21.9	22.3	22.1	21.6	21.7	21.9	21.9
Short circuit current (A)	1.29	1.3	1.84	2.74	2.58	2.67	3.14	3.29	3.84	4.19	4.19
V <sub>max</sub>	17.6	17.4	17.5	15.4	17.6	18	17.8	17.3	17.3	17.6	17.6
I <sub>max</sub>	1.14	1.21	1.71	2.27	2.28	2.5	2.82	2.94	3.47	3.7	3.7
Number of cells in series	36	32	36	36	36	36	36	36	36	36	36

Parameter	Panel rating, W <sub>p</sub>								
	74	75	80	85	90	100	120	125	130
Rated peak power, W <sub>p</sub>	74	75	80	85	90	100	120	125	130
Type (a-Si, Crystalline Si, etc.)	Cryst Si	Cryst Si	Cryst Si	Cryst Si	Cryst Si	Cryst Si	Cryst Si	Cryst Si	Cryst Si
Useful energy (Ah/day)	20.47	21.10	22.1	23.04	243	27.40	34.87	34.11	35.23
Open circuit voltage (V)	21.5	21.7	21.9	22.1	22	21.56	21.8	21.6	21.6
Short circuit current (A)	4.55	4.69	4.91	5.12	5.4	6.09	7.75	7.58	7.83
V <sub>max</sub>	18	17.5	17.6	17.8	17.6	17.79	17.2	17.8	17.96

$I_{max}$	4.25	4.29	4.55	4.78	5.12	5.63	6.98	7.02	7.26
Number of cells in series	36	36	36	36	36	36	36	36	36

**Existing Scenario**

Prior to the implementation of the SHS units under this CPA, use of kerosene lamps for lighting and diesel generators for charging batteries for electrical devices was the existing practice.

- Two types of kerosene lamps are used – hurricane lamps and open flame burners called “kupies”.
- Batteries used for running for entertainment purpose (TV), charging mobile, etc., are charged using diesel generator sets in local village shops.

**Baseline Scenario**

The conditions prior to this implementation of the SHS units and the baseline scenario are one and the same.

**A.4. Coordinating/managing entity**

Infrastructure Development Company Limited (IDCOL)

**A.5. Parties and CPA implementers**

Parties involved	CPA implementers	Indicate if the Party involved wishes to be considered as CPA implementer (Yes/No)
Bangladesh (host)	Infrastructure Development Company Limited (IDCOL).	No

**A.6. Public funding of CPA**

IDCOL is a state entity. It received funding from the Government of Bangladesh to support the SHS programme as follows:

- KfW and GTZ provide funding to the Government of Bangladesh which provides this to IDCOL for the SHS program. IDCOL in turn provides funding to POs to support a buy down of 40 Euro per SHS; and
- The World Bank Group (International Development Association - IDA) provides loan finance to the Government of Bangladesh, which in turn was provided to IDCOL. The programme is known as “Rural Electrification and Renewable Energy Development Project (REREDP)”. IDCOL further lends this finance to POs to extend credits to the buyers of SHS.

This financing does not constitute any diversion of public resources or of ODA.

The financing assists to support lighting which is regarded as a basic need irrespective of the greenhouse gas mitigation benefits which the program may deliver.

**A.7. History of CPA**

The respective PoA was registered on 26-June-2012

Subsequent to this, PoA has successfully undergone renewal of its crediting period on 21 September 2020.

This particular CPA inclusion date is 30-08-2013.

Till date no other PoA/project activity on solar home systems has been registered as a CDM project from Bangladesh. Hence, it is confirmed that this small-scale project activity is neither registered as an individual CDM project activity nor a part of any another registered PoA.

### **A.8. Debundling**

Paragraph 14 of “Guidelines on assessment of de-bundling for SSC Project Activities”, version 04, EB 83, Annex 13, stipulates the following:

“If each of the independent subsystems / measures (e.g., biogas digester, solar home system) included in the CPA of a PoA is no larger than 1% of the small-scale threshold defined by the methodology applied, then that CPA of PoA is exempted from performing de-bundling check, i.e., considering as not being a de-bundled component of a large scale activity”.

The maximum capacity rating of a SHS unit installed in this CPA is 130 Wp.

Percentage of energy generation with respect to small-scale threshold limit of 15 MW  
 $= (130 \text{ W} / [15 \times 1,000,000 \text{ W}]) \times 100 = 0.0009 \%$ .

As is demonstrated above, the maximum energy generation by a single SHS unit is much less than the 1% of the small-scale threshold of 15 MW.

Hence, the SSC-CPA is not a de-bundled component of a large scale activity.

## **SECTION B. Application of methodologies and standardized baselines**

### **B.1. References to methodologies and standardized baselines**

Title : Type I: Renewable energy projects

Reference : AMS-I.A. - Electricity generation by the user<sup>4</sup>

Version : 17, EB 103, Annex 05

Sectoral scope: 1, Energy industries (renewable / non-renewable sources)

The following guidelines are also referred:

- General guidelines for SSC CDM methodologies", Version 23, EB 104, Annex 05
- Standard for Sampling and surveys for CDM project activities and programme of activities, Version 09
- Guidelines for sampling and surveys for CDM project activities and programmes of activities, Version 04, EB 86, and Annex 04.

It is confirmed that the selected methodology is applicable for the CPAs under the small scale PoA.

The component project activity is the electricity generation by the user. The CPAs under the proposed PoA introduces renewable energy generation units that supply individual households or users with a small amount of electricity under the category as defined in AMS-I.A. - Electricity generation by the user, version 17, EB 103. The applicability is limited to the households and the users without grid connection.

The SHS units use solar power technology to produce electricity, all of which is used on-site by the user. The total capacity of all these renewable energy units, per CPA shall not exceed 15 MW.

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<sup>4</sup> <https://cdm.unfccc.int/methodologies/DB/KDHBNSAMLG4HC7WW9GMRJ2KEXZMY9S>

The General Guidelines for SSC CDM methodologies, version 23 dated 12 September 2019, paragraph 4.17 states the following:

In the case of CPAs solely composed of “microscale CDM units”, the coordinating/managing entity is not required to demonstrate compliance with the small-scale CDM thresholds at the aggregate level of the CPA. In such cases:

- a) The definition of ‘microscale CDM units’ provided under section “5.1 Application of microscale thresholds at unit level for CPAs”<sup>5</sup> of the methodological tool “Demonstration of additionality of microscale project activities” shall apply;
- b) 95/10 precision shall be applied for sampling surveys in accordance with the standard for “Sampling and surveys for CDM project activities and programmes of activities”.

Further section 6 of the Tool: Demonstration of additionality of microscale project activities, version 9, dated 29 Nov 2018 mentions the following:

For CPAs applying microscale thresholds at the unit level rather than at the aggregate level of the CPA, the term ‘project activities’ in paragraphs 4 and 11 to 13 above shall be read as ‘units’.

If each of the units contained in the CPA satisfies the condition to qualify as a ‘microscale CDM unit’, then the coordinating/managing entity is not required to demonstrate compliance of the CPA with the microscale or small-scale thresholds at the aggregate level of the CPA. In such cases, the requirements related to de-bundling stated in paragraph 6 above do not apply.

Para 11 of the aforesaid Tool refers to renewable energy technology up to 5 MW installed capacity and the project activity is located in a LDC country along with it being a solar PV technology for distributed energy generation where end users are households, communities or small and medium-sized enterprises.

Thus, all units will remain under the micro-scale limit throughout the year, and compliance with the requirement of methodology is not required as per aforesaid and para 124(m) of Standard: CDM project standard for programmes of activities, version 2.0.

“If the generic CPA is small-scale or microscale, conditions to ensure that CPAs that will be included meet the small-scale or microscale thresholds and remain within those thresholds throughout the crediting period of the CPAs. However, if the generic CPA consists solely of units that qualify as “microscale CDM units” as defined in the “Methodological tool: Demonstration of additionality of microscale project activities”, these conditions are not required.”

Hence, the applicable baseline methodology for the proposed component project activity is as per AMS-I.A. – Electricity generation by the user, version 17, EB 103 of indicative simplified baseline and monitoring methodologies.

The justification of applicability conditions (as per methodology AMS-I.A.- Electricity generation by the user, version 17, EB 103) are also listed in the following tables:

No.	Applicability condition	Justification
1.	This category comprises renewable electricity generation units, such as solar photovoltaic, hydro, wind and renewable biomass that supply electricity to individual	Applicable. The SHS units are the renewable energy generation using Solar power that supplies

<sup>5</sup> Units of capacity up to 5 MW that employ renewable energy technology or that achieve energy savings at a scale of no more than 20 GWh per year or that achieve emission reductions at a scale of no more than 20 ktCO<sub>2</sub>e per year, located in LDCs or SIDS or special underdeveloped zones (SUZs) of non-Annex I countries.

	households/users or groups of households/users.	electricity to the dedicated households.
2.	The methodology is applicable to project activities that involve new installations (greenfield) or replace existing onsite fossil-fuel-fired generation.	Applicable  The SHS units are greenfield in nature. The SHS unit would replace the existing fossil fuel usage of kerosene as fuel for lighting application and diesel in generator sets at local stores used for charging the domestic batteries
3.	<p>The applicability of the methodology is limited to individual households and users that do not have a grid connection except when:</p> <ul style="list-style-type: none"> <li>a) A group of households or users are supplied with electricity through a standalone mini-grid powered by renewable energy generation unit(s) where the capacity of the generating units does not exceed 15 MW (i.e. the sum of installed capacities of all renewable energy units connected to the mini-grid is less than 15 MW) e.g. a community-based stand-alone off-the-grid renewable electricity systems; or</li> <li>b) For renewable energy-based lighting applications, the emission reductions per system is less than 5 tonnes of CO<sub>2</sub>e a year and it shall be demonstrated that that fossil fuels would have been used in the absence of the project activity by: <ul style="list-style-type: none"> <li>i. A representative sample survey of target households; or</li> <li>ii. Official statistics from the host country government agencies;</li> </ul> </li> <li>c) A group of households or users are connected to a grid prior to the start date of the project activity (or the start date of validation with due justification), however the electricity from the grid is available for the households and users for less than 36 hours in any given calendar month during the crediting period or the grid connected household coverage in the host country is less than 50%.</li> </ul>	<p>Applicable.</p> <p>The SHS units are greenfield in nature and the individual household do not have a grid connection.</p>
4.	The methodology is not applicable to project activities that include units that will be connected to the grid at any time during the crediting period.	IDCOL Inspectors randomly inspect the newly installed SHS to confirm the technical standards and that the SHS has been installed in a rural area to a non-grid connected household. An Inspection Report is produced. The results of the Inspection Report are fed into the IDCOL data base. If the inspection Report indicates that a SHS has been installed in conflict with the program eligibility criteria such as, in an urban area or



		to a grid connected household, a Discrepancy Report is generated. The SHS then becomes ineligible under the program and is accordingly not eligible to receive any IDCOL financing. A clear system exists for excluding ineligible SHS under the program.
5.	Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: a. The project activity is implemented in an existing reservoir with no change in the volume of reservoir; b. The project activity is implemented in an existing reservoir, where the volume of reservoir is increased, and the power density of the project activity is greater than 4 W/m <sup>2</sup> ; c. The project activity results in new reservoirs and the power density of the power plant, is greater than 4 W/m <sup>2</sup> .	Not applicable as this is not a hydro power plant.
6.	Combined heat and power (cogeneration) systems are not eligible under this category	Not applicable as this is not a Combined heat and power (cogeneration) system.
7.	If the electricity generation unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	Not applicable as this project don't have non-renewable component.
8.	Project activities that involve retrofit or replacement of an existing renewable electricity generation unit are included in this category. To qualify as a small-scale project, the total output of the modified or retrofitted unit shall not exceed the limit of 15 MW.	Not Applicable as this project doesn't involves retrofit or replacement of existing renewable electricity generation.
9.	In the case of project activities that involve the addition of renewable electricity generation units to an existing renewable electricity generation facility, the total capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	Not applicable as the total capacity will not be more than 15 MW.
10.	In cases where the project activity utilizes biomass, the applicability conditions of "TOOL16: Project and leakage emissions from biomass" shall apply.	Not applicable as the component project activity doesn't utilizes biomass.

## B.2. Project boundary, sources and greenhouse gases (GHGs)

The GHG reduced through this CPA is CO<sub>2</sub>. The reduction takes place through avoidance of fossil fuel:

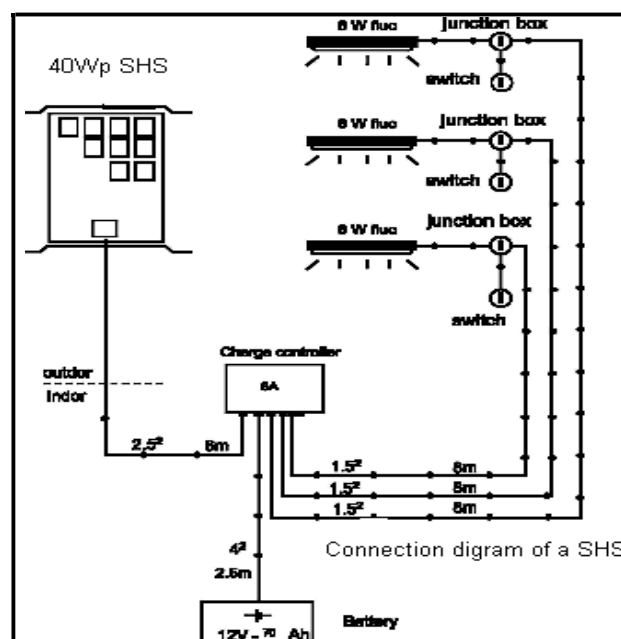
- For use in households and small commercial establishments for lighting in kerosene lamps (kupies / hurricane)

- For small diesel generators that would have been installed in the absence of the CDM activity to expand lighting and electricity use in rural areas, where users were not connected to the national electricity grid.

	Source	GHG	Included?	Justification/Explanation
Baseline	Combustion of fossil fuel by lamps in households and electricity generators at shops for charging batteries in isolated areas	CO <sub>2</sub>	Included	Main emission source
		CH <sub>4</sub>	Excluded	Excluded for simplification
		N <sub>2</sub> O	Excluded	Excluded for simplification
Project activity	Combustion of fossil fuel in lamps at households in isolated areas	CO <sub>2</sub>	Excluded	Lamps might only be used when the SHS is not in operation and during maintenance days (25 days). Since these days are already excluded from SHS operational days and the emission reduction calculations, the emissions due to lamps in the project activity has been excluded.
		CH <sub>4</sub>	Excluded	No emission source
		N <sub>2</sub> O	Excluded	No emission source

The CPA is located within the Peoples' Republic of Bangladesh as stated in section A.7, which also forms the PoA boundary. This is evidenced in IDCOL's comprehensive database which provides a unique identification number for each SHS consumer / installation under this CPA.

The schematic diagram of connected loads to a typical 40 Wp system is shown below:



There are no project emission sources. The monitoring parameter is the count of the systems installed and operating.

### B.3. Establishment and description of baseline scenario

Updated baseline for the second crediting period in line with the "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period." Version 03.0.1.

This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as required by paragraph 283 to 286 of Project Standard for program activities version 02.0. The tool stipulates the following steps to be carried out.

There is no other baseline scenario apart from the implementation of an alternative program of diesel generators. The baseline scenario is thus the continued usage of kerosene for lighting purpose and batteries for entertainment purpose (TV) charged from local village shops using diesel generator sets in the absence of any rural electrification program to supply the same service of electricity as supplied by the SHS CDM project

Step 1: Assess the validity of the current baseline for the next crediting period.

The "Procedures for the renewal of the crediting period of a registered CDM project activity" approved by the CDM Executive Board require assessing the impact of new relevant national and/or sectoral policies and circumstances on the baseline.

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies.

For the second crediting period, baseline scenario remains unchanged and is in compliance with all the relevant mandatory national and/or sectoral policies. No new national and/or sectoral policies have been announced that is available in public domain that affects the original baseline.

Step 1.2: Assess the impact of circumstances.

The program to provide electricity to users in off-grid, remote and rural areas with SHS. These SHS users currently have no access to grid connected electricity and currently use kerosene for lighting and batteries for entertainment purpose (TV) charged from local village shops using diesel generator sets. Circumstances are seen to be same at the time of requesting renewal of crediting period.

In total rural population, kerosene is still seen as the source of lighting for off grid population and alternative source of the solar home system (SHS) which is likely to continue in the absence of the program.

The baseline scenario identified at the validation of the component project activity was the continuation of the current practice without any investment. Hence, the current baseline does not need to be updated for the second crediting period.

Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested.

As explained in step 1.2, the baseline scenario was the kerosene using by household in off grid areas and the program to provide electricity to users in off-grid, remote and rural areas with SHS.

The project activity in green field project and it is unlikely that any baseline equipment or investment involved in project activity. Therefore, this condition is not applicable to the project activity.

Step 1.4: Assessment of the validity of the data and parameters

There is no change in the value of the ex-ante parameters.

Step 2: Update the current baseline and the data and parameters.

This step is only applicable if any of the Steps 1.1, 1.2, 1.3 and/or 1.4 showed that the current baseline needs to be updated.

Step 2.1: Update the current baseline.

The current baseline emissions for the second crediting period are updated, wherever required, based on the latest AMS-I.A Version 17.0 applicable to the project activity.

Step 2.2: Update the data and parameters.

All parameters remain the same.

Impact of the national and/or sectoral policies and circumstances upon the baseline scenario of the project activity.

There is no restriction to use of kerosene for lighting purpose as per local regulation.

In accordance with the procedures for renewal of crediting period of a registered PoA, the original baseline scenario remains valid taking new relevant national and/or sectoral policies into account; and the baseline emissions are updated, wherever required, in accordance with step 1.2 and 2.2 for the second crediting period.

The baseline scenario for all CPAs have been set ex-ante in PoA itself in Section I.2. - Description of the baseline scenario of part II. Generic component project activity (CPA).

The baseline scenario is the continued usage of kerosene for lighting purpose and batteries for entertainment purpose (TV), charged from local village shops, using diesel generator sets, in the absence of any rural electrification programme to supply the same service of electricity as supplied by the SHS CDM project.

#### **B.4. Estimation of emission reductions**

##### **B.4.1. Explanation of methodological choices**

SHS follows the requirements defined in paragraph 8 of AMS-I.A., version 17, EB 103 which states that *"If the electricity generation unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component"*. The emission reduction estimates are based on the fuel consumption of the technology that would have been used in the absence of the project activity to generate the equivalent quantity of lighting service using option 3 of paragraph 24..

The equations are listed below:

##### **1. Calculation of baseline emissions**

As the SHS replaces usage of kerosene for lighting and usage of diesel for charging batteries at local diesel generator stations for running a black and white TV, the baseline is:

- Amount of kerosene that is being consumed in the number of kerosene lamps equivalent to the number of CFL lamps installed per household.
- Amount of diesel consumed equivalent to quantity of electricity required to charge the batteries

- a) Emission reductions due to replacement of kerosene consumption per lamp are calculated as follows:

$$BE_y = \sum_j FC_{j,y} \times NCV_j \times EF_{CO_2,j}$$

Where,

BE<sub>y</sub> - Baseline emissions in year y (t CO<sub>2</sub>/yr)  
 FC<sub>j,y</sub> - Projected fuel consumption of fuel type j in year y (mass or volume unit)  
 NCV<sub>j</sub> - Net calorific value of fuel type j ((GJ per mass or volume unit)  
 EF<sub>CO<sub>2</sub>,j</sub> - CO<sub>2</sub> emission factor of fuel type j (t CO<sub>2</sub>/GJ)

. Baseline emissions

AMS-I.A. provides for the determination of the baseline as follows: “If the energy displaced is fossil fuel based, then the energy baseline is the existing level of fuel consumption or the amount of fuel that would be used by the technology that would have been implemented otherwise.”

As the existing technology replaces usage of kerosene for lighting and usage of diesel at local diesel generator stations for charging flat batteries, which are used for running appliances like a black and white TV, the baseline is:

Amount of kerosene that is being consumed in number of Kupi lamps equivalent to the number of CFL lamps installed per household.

Amount of diesel consumed in diesel generators equivalent to quantity of electricity required to charge the batteries. However, for simplicity of calculating emission reductions, this figure is disregarded, which is conservative.

### Amount of fuel consumed per lamp

The amount of fuel (kerosene) required to burn the Kupi lamp is determined on conservatively based on various studies conducted and literature surveyed. Based on this a value of 0.04 litres/hours is used for the estimation of emission reductions.

The following studies and literature is considered for arriving at historical fuel consumption data for Kerosene lamps for lighting in Bangladesh:

- Report on “Impact of climate change on livelihoods and employment<sup>23</sup>” by International Labour Organisation (ILO), mentions the use of 10-12.5 litres/month (0.09 – 0.12 l/h) of kerosene per household in the country.
- A paper on “Replacing Kerosene based lighting systems with the White LED in Rural Area in Bangladesh through solar energy<sup>24</sup>” quotes the consumption of 0.06 l/h for a Kupi lamp.
- A report on ‘Assessment of carbon dioxide reduction potential and energy payback period of solar home systems in developing countries: Case of Bangladesh<sup>25</sup>’ mentions replacement of 17 litres/month (0.16 l/h) by households opted for 35Wp system and 20 to 22 litre per month (0.19-0.2 l/h) for 50 Wp system.
- A survey by Grameen Shakti for a sample of households identifies number of lamps each household has in the baseline and estimation of fuel consumption based on standard consumption values (based on literature data) confirms the kerosene consumption in the range of 60 to 190 litre per annum depending on number of lamps in each household.
- Energy research Centre of Netherlands’ (ECN), Netherland’s Global emission reduction formula suggests using 75 + 4Wp as emission reduction potential for each SHS. This is in

line with Certified Emission Reduction Procurement Tender (CERUPT) methodology for off-grid project activities.

The summary of the above is as below:

Source	Consumption, l/h	Remarks
Report on “Impact of climate change on livelihoods and employment” by ILO	0.09 – 0.12	
A paper on “Replacing Kerosene based lighting systems with the White LED in Rural Area in Bangladesh through solar energy”	0.06	
A report on ‘Assessment of carbon dioxide reduction potential and energy payback period of solar home systems in developing countries: Case of Bangladesh’	0.16 for 35Wp 0.19-0.21 for 50 Wp	
Survey by Grameen Shakti	60 to 190 litres per annum	Based on number of lamps in each household
ECN, Netherlands	40 Wp: 235 kg CO <sub>2</sub> /yr 65 Wp: 330 kg CO <sub>2</sub> /yr 80 Wp: 395 kg CO <sub>2</sub> /yr	

Based on review of all above mentioned, to be on the conservative side, a value of 0.04 l/h is considered for baseline emission calculations.

This approach is adopted for the following reasons:

- A sample survey by Grameen Shakti during early 2009 indicated a huge variation in the consumption pattern among households. The consumption levels vary between 50 litres and more than 180 litres depending on the financial capabilities of individual households.
- Differentiating households on the basis of their financial capability and determining baseline for each category is very cumbersome and might not help much as it already indirectly reflects the capacity of SHS chosen by individual households.
- Out of all the information sources available on baseline kerosene consumption for Kupa lamps, the adopted value is observed to be very conservative.

Operating days per annum

For conservative purpose, 25<sup>6</sup> days per annum have been deducted to include any non-functioning days due to SHS system maintenance. As per the manufacturer specifications, the system is guaranteed to operate all days including rainy days. Hence the number of days per annum is considered as 340 days.

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<sup>6</sup> For leap years, it is conservatively assumed to be 26 days per year

As per the methodology guidance, 3.5 hours are considered per day for calculation of baseline emissions. Operating hours per annum =  $3.5 \times 340 = 1,190$  hr

Kerosene consumption per lamp per year =  $0.04 \times 1190 = 47.6$  litres

Emission factor for one litre consumption of Kerosene

Parameter	Value	Unit	Reference
Kerosene consumption	1	litre	
Density of kerosene	0.75	kg/litre	Weblink <sup>7</sup>
Net calorific value of kerosene, NCV <sub>j</sub>	43.8	TJ/Gg	IPCC 2006 <sup>8</sup>
Emission coefficient for kerosene EFCO <sub>2,j</sub>	71.9	kg CO <sub>2</sub> /GJ	IPCC 2006 <sup>9</sup>
Kerosene consumption	0.75	kg	Calculation
	0.00000075	Gg	Calculation
	0.00003285	TJ	Calculation
	0.03285	GJ	Calculation
CO <sub>2</sub> emissions per litre of kerosene usage	2.3619	kg CO <sub>2</sub> /litre	Calculation

Baseline emissions per lamp per year =  $47.6 \times 2.3619 = 112.43$  kg CO<sub>2</sub>/lamp/yr

### Number of kerosene lamps replaced per SHS of different panel rating (N<sub>k</sub>)

The number of kerosene lamps that would have been used in the baseline (N<sub>k</sub>) is conservatively considered based on the survey results of Grameen Shakti. The table 3 provides the number of kerosene lamps that would have been replaced for different rating of SHS:

Table 3. Number of kerosene lamps replaced

SHS Rating range, W <sub>p</sub>	20 - 39	40 - 74	75 - 119	120 & above
No. of kerosene lamps that would be replaced per SHS, N <sub>k</sub>	1	2	3	4

For the calculation of number of kerosene lamp replacements for individual SHS ratings, the above table values are directly referred to during CER estimation.

The numbers considered here are conservative considering the following:

<sup>7</sup> <http://www.answers.com/topic/kerosene>

<sup>8</sup> IPCC 2006 ; Energy, Chapter 1 - Table 1.2

<sup>9</sup> IPCC 2006 ; Energy, Chapter 1 - Table 1.4

- The total load connected to each SHS (including lamps each of 6 W and one Black & White TV of 10W) is below the rated capacity of each SHS.
- Number of lamps selected for a SHS unit also reflects the current lighting needs and affordability of each household based on their need, demand and capacity.

Total number of kerosene lamps replaced in the baseline is calculated based on number of SHS installed and operational as well as the connected lamps for each SHS.

$$N_y = \sum SHS_{wp,y} \times N_k$$

where,

SHS<sub>wp,y</sub> - No. of SHS of capacity Wp installed and operational in year y  
 N<sub>k</sub> - No. of kerosene lamps replaced per SHS of installed capacity Wp

b) Emission reductions from avoiding charging batteries from local shop using diesel set

All SHS units above 40Wp of their size (Wp) are expected to operate one 10W Black & White TV. This avoids the usage of batteries and their charging from local stores using diesel sets. The following table provides details of emission reductions.

TV - Black & White	
Nos.	1
Wattage	10
Hours per day	3
Baseline	
Battery Capacity (Ah)	30
Battery Voltage (V)	12
Battery Capacity (kWh)	0.36
No. of charges per year	24 (2 per month)
Charging efficiency of the battery (%)	85
Annual consumption (kWh)	10.2
CO <sub>2</sub> emission coefficient of diesel (kg CO <sub>2</sub> /kWh)	0.8 (IPCC 2006)
Annual CO <sub>2</sub> savings (kg CO <sub>2</sub> /yr)	8.1

However, considering the very small potential for CO<sub>2</sub> savings out of the replacement of diesel, this portion of the baseline emissions are ignored for the final baseline calculations. This is conservative.



Baseline emissions are therefore calculated as:

$$BE_y = 112.43 \times N_y \text{ kg CO}_2/\text{yr}$$

## 2. Calculation of project emissions

Since the power generation is from solar power, project emissions are assumed to be zero.

$$PE_y = 0 \text{ t CO}_2/\text{yr}$$

## 3. Calculation of leakage emissions

As per latest the CDM guideline, "General guidelines for SSC CDM methodologies", Version 23.0, EB104, Annex 5, Section N. Leakage due to transfer of equipment, it is stated in para 26 that:

*"For Type I methodologies, the requirement that the replaced energy-generating equipment should be scrapped and that this scrapping should be independently monitored is not needed since under most circumstances the replaced equipment would most likely replace less efficient equipment outside the project boundary."*

Hence, the retaining of old kerosene lamps need not be monitored, and the leakage emissions are considered to be zero for this PoA

$$LE_y = 0 \text{ t CO}_2/\text{yr}$$

## 4. Calculation of emission reductions

$$ER_y = (BE_y - PE_y) - LE_y$$

Where,

ER<sub>y</sub> - Emission reductions in year y (t CO<sub>2</sub>e)

BE<sub>y</sub> - Baseline emissions in year y (t CO<sub>2</sub>e)

PE<sub>y</sub> - Project emissions in year y (t CO<sub>2</sub>e)

LE<sub>y</sub> - Leakage emissions in year y (t CO<sub>2</sub>e)

### B.4.2. Data and parameters fixed ex ante

Data/Parameter	EF <sub>CO<sub>2</sub>,j</sub>
Data unit	t CO <sub>2</sub> e/kl
Description	Emission factor for kerosene
Source of data	Calculated using default values provided in 2006 IPCC guidelines
Value(s) applied	2.3619
Choice of data or measurement methods and procedures	Based on IPCC values (IPCC 2006; Energy, Chapter 1 - Table 1.2)
Purpose of data	To calculate the baseline emissions
Additional comment	Not applicable

Data/Parameter	FC <sub>j,y</sub>
Data unit	litres
Description	Annual consumption of kerosene per kerosene lamp
Source of data	Literature survey and lab results along with a sample survey
Value(s) applied	47.6

Choice of data or measurement methods and procedures	-
Purpose of data	To calculate the baseline emissions
Additional comment	Not applicable

<b>Data/Parameter</b>	T
Data unit	Hours/day
Description	Daily usage of technologies for the generation of lighting
Source of data	Default value as suggested in AMS-I.A.
Value(s) applied	3.5
Choice of data or measurement methods and procedures	As suggested in the methodology AMS-I.A.- Electricity generation by the user, version 17, EB 103
Purpose of data	To calculate the baseline emissions
Additional comment	Not applicable

<b>Data/Parameter</b>	D
Data unit	Days
Description	Annual operating days of SHS units replacing the kerosene lamps
Source of data	Manufacturer specifications
Value(s) applied	340
Choice of data or measurement methods and procedures	As per the manufacturer specifications, the SHS is guaranteed to operate all days of year, including rainy days as the SHS retains charge for approximately 3 days without requiring additional charging. However, for conservative purposes, 25 days 18 per year have been deducted to include possible days when a SHS may not be functioning due to system maintenance or any other reasons. Hence, the number of operating days per annum is considered to be 340 days. The value is fixed ex-ante.
Purpose of data	To calculate the baseline emissions
Additional comment	Not applicable

<b>Data/Parameter</b>	Density <sub>k</sub>
Data unit	kg/litre
Description	Density of kerosene
Source of data	<a href="http://www.answers.com/topic/kerosene">http://www.answers.com/topic/kerosene</a> (Columbia Encyclopedia)
Value(s) applied	0.75
Choice of data or measurement methods and procedures	The value is fixed ex-ante.
Purpose of data	To calculate the baseline emissions
Additional comment	Not applicable

<b>Data/Parameter</b>	NCV <sub>j</sub>
Data unit	TJ/Gg
Description	Net calorific value of kerosene
Source of data	IPCC 2006 - Volume 2 Energy, Chapter 1, Table 1.2, pg 1.18
Value(s) applied	43.8
Choice of data or measurement methods and procedures	The value is fixed ex-ante.

Purpose of data	To calculate the baseline emissions
Additional comment	Not applicable

<b>Data/Parameter</b>	N <sub>k</sub>
Data unit	Units
Description	Number of kerosene lamps replaced
Source of data	Fixed conservatively based on the results of the Grameen Shakti survey
Value(s) applied	Fixed for a capacity range of SHS installed as per manufacturer specifications on number of CFL installed as part of each SHS
Choice of data or measurement methods and procedures	This number is calculated based on a survey <sup>10</sup> conducted by Grameen Shakti using the questionnaire for sample households to identify the number of SHS operational during the year y
Purpose of data	To calculate the baseline emissions
Additional comment	Not applicable

### B.4.3. Ex ante calculation of emission reductions

AMS-I.A. - Electricity generation by the user, version 17, EB 103, provides guidelines for the determination of the baseline as follows: "The energy baseline is the fuel consumption of the technology in use or that would have been used in the absence of the project activity to generate the equivalent quantity of energy".

As the SHS technology replaces usage of kerosene for lighting and usage of diesel at local diesel generator stations for charging batteries for running appliances like black and white TV, the baseline is:

- Amount of kerosene that is being consumed in number of kupi / hurricane lamps equivalent to the number of CFL lamps installed in households
- Amount of diesel consumed in generators equivalent to quantity of electricity required to charge the batteries

As per the registered PoA, considering the very small potential for CO<sub>2</sub> savings out of the replacement of diesel, this portion of the baseline emissions are ignored for the final baseline calculations.

Hence, the emissions reductions are estimated only for the replacement of kerosene lamps.

#### **Estimation of baseline emissions:**

- a) Number of kerosene lamps replaced per SHSs of different panel ratings (N<sub>k</sub>)

The number of kerosene lamps replaced per SHSs of different panel ratings is taken from the survey conducted by Grameen Shakti as below:

SHS Rating range, Wp	20 - 39	40 -74	75 -119	120 & above
No. of kerosene lamps that would be replaced per SHS, N <sub>k</sub>	1	2	3	4

- b) Total number of kerosene lamps replaced in each capacity (N<sub>y</sub>)

<sup>10</sup> Survey methodology and implementation report: kerosene consumption for solar home systems in Bangladesh: January, 2009

$$N_y = \sum SHS_{wp,y} \times N_k$$

Where,

$SHS_{wp,y}$

- No. of SHS of capacity Wp installed and operational in year y

$N_k$

- No. of kerosene lamps replaced per SHS of installed capacity Wp

No.	SHS capacity (Wp)	No. of installations	No. of kerosene lamps replaced (Ny)
1	20	108,491	108,491
2	21	22	22
3	30	50	50
4	35	3,053	3,053
5	40	42,853	85,706
6	45	14,128	28,256
7	50	50,595	101,190
8	55	601	1,202
9	60	3,448	6,896
10	65	18,258	36,516
11	70	270	540
12	74	4	8
13	75	4,758	14,274
14	80	846	2,538
15	85	23,133	69,399
16	90	2,131	6,393
17	100	363	1,089
18	120	296	1,184
19	125	5	20
20	130	26	104
21	140	1	4
22	160	1	4
	<b>Total</b>	<b>273,333</b>	<b>466,939</b>

c) Baseline estimation

$$BE_{co2y} = N_y \times \sum_j FC_{j,y} \times NCV_j \times EF_{co2,j}$$

Where,

$BE_{co2,y}$

- Baseline emissions in year y (t CO<sub>2</sub>/yr)

$N_y$

- Total number of kerosene lamps replaced in year y (nos.)

$FC_{j,y}$

- Amount of fuel consumption of fuel type j per lamp in year y (litres)

$NCV_j$

- Net calorific value of fuel type j (TJ/Gg)

$EF_{co2,j}$  - CO<sub>2</sub> emission factor of fuel type j (t CO<sub>2</sub>/GJ)

Baseline emission for a number of SHS units that replace a single kerosene lamp is therefore calculated as:

$$\begin{aligned} BE_{co2,y} &= (112.43/1000) \times N_y \text{ tCO}_2/\text{Yr} \\ &= 0.11243 \times 466,939 \\ &= 52,496 \text{ tCO}_2/\text{Yr} \end{aligned}$$

### **Estimation of project emissions:**

Since the power generation is from solar power, the project emissions are assumed to be zero.

$$PE_y = 0 \text{ t CO}_2/\text{yr}$$

### **Estimation of leakage emissions:**

As per latest the CDM guideline, "General guidelines for SSC CDM methodologies", Version 23.0, EB104, Annex 5, Section N. Leakage due to transfer of equipment, it is stated in para 26 that:

*"For Type I methodologies, the requirement that the replaced energy-generating equipment should be scrapped and that this scrapping should be independently monitored is not needed since under most circumstances the replaced equipment would most likely replace less efficient equipment outside the project boundary."*

Hence, the retaining of old kerosene lamps need not be monitored, and the leakage emissions are considered to be zero for this PoA

$$LE_y = 0 \text{ t CO}_2/\text{yr}$$

### **Estimation of emission reductions**

$$ER_y = (BE_y - PE_y) - LE_y$$

$$= 52,496 - 0 - 0$$

$$= 52,496 \text{ t CO}_2/\text{yr}$$

#### **B.4.4. Summary of ex ante estimates of emission reductions**

Year	Baseline emissions (t CO <sub>2</sub> e)	Project emissions (t CO <sub>2</sub> e)	Leakage (t CO <sub>2</sub> e)	Emission reductions (t CO <sub>2</sub> e)
2021 <sup>11</sup>	30,623	0	0	30,623
2022	52,496	0	0	52,496
2023	52,496	0	0	52,496
2024	52,496	0	0	52,496
2025	52,496	0	0	52,496
2026	52,496	0	0	52,496
2027	52,496	0	0	52,496
2028 <sup>12</sup>	21,873	0	0	21,873
<b>Total</b>	367,472	0	0	367,472
<b>Total number of crediting years</b>	07			
<b>Annual average over the crediting period</b>	52,496	0	0	52,496

#### **B.5. Monitoring plan**

##### **B.5.1. Data and parameters to be monitored**

<b>Data/Parameter</b>	SHS
<b>Data unit</b>	Units
<b>Description</b>	Number of SHS Installed

<sup>11</sup> 1 May 2021 to 31 Dec. 2021

<sup>12</sup> 1 Jan. 2028 to 30 April 2028

Source of data	IDCOL SHS database
Value(s) applied	273,333
Measurement methods and procedures	Total count of 100% SHS installations of the households / consumers collected and stored. The number of SHS units under different rating is also monitored in the IDCOL SHS database
Monitoring frequency	Continuous. The POs submit their installation data every month to IDCOL, which then updates it to the IDCOL SHS database.
QA/QC procedures	<p>SHSs on which discrepancy reports are generated, are excluded, if found to be in urban areas or provided to grid connected households / consumers at the time of installation.</p> <p>Less than 0.5% of SHS consumers purchase a second SHS. Second SHS or ineligible SHS (SHS which generate Discrepancy Report) are excluded from the project as well as from claiming emission reductions.</p> <p>Since the total SHS installations, without discrepancies, under a CPA may change based on inspection reports generated every month, the total number of SHS installations in IDCOL SHS database, without any discrepancies, as on the end date of every monitoring period will be taken for CER calculation for the respective monitoring period. Proof of screenshot of total SHS installation without any discrepancies under each CPA at the end of a monitoring period will be captured from the IDCOL SHS database and stored for verification.</p>
Purpose of data	To calculate the baseline emissions
Additional comment	Data is collected using the standard procedures and is stored for the crediting period and an additional two years

<b>Data/Parameter</b>	SHS <sub>wp,y</sub>
Data unit	Units
Description	Number of SHSs that are operational
Source of data	IDCOL monitoring survey result
Value(s) applied	273,333 (value used for ex-ante calculation. This value is monitored through sampling surveys during ex-post emission reduction calculation).
Measurement methods and procedures	<p>100% of project SHS information is stored in the IDCOL SHS data base on CPA basis. A sample is drawn at 95% confidence level and at +/- 10% error margin from the IDCOL SHS data base to monitor and calculate number of operational SHS. The monitoring survey is carried out as a single survey for all SHS under the PoA or each survey for sub-groups of SHSs belonging to the PoA during that monitoring period. The grouping of SHSs decides accordingly at each monitoring period.</p> <p>In instances where a % of SHS units in a sample are found not to be working, a discount of the same % will be applied to the overall emission reductions of respective survey population to ensure conservativeness.</p>
Monitoring frequency	Annual
QA/QC procedures	Random number generators from MS-Excel will be used to select samples. The total number of SHS installations without any discrepancies at the end date of a monitoring period will be taken for sample survey to estimate the number of operational systems.
Purpose of data	To calculate the baseline emissions
Additional comment	Data are collected using the standard procedures and are stored for the crediting period and an additional two years

<b>Data/Parameter</b>	PR
Data unit	Units

Description	The payment receipt of easy monthly instalments (EMI) to POs by individual SHS owner
Source of data	The implementing organization
Value(s) applied	Variable has not been considered for calculation
Measurement methods and procedures	Implementing organization collects EMI receipts from the individual households
Monitoring frequency	Continuous
QA/QC procedures	Three copies of EMI receipts are made. One for household, one for the PO branch office and the other for the PO zonal / divisional office. Thus, at any point of time, the EMI receipts shall be cross verified by the higher-level management of PO / IDCOL. A passbook to register the number of EMIs paid is also maintained with each household.
Purpose of data	To cross check the SHS installations details
Additional comment	Data are collected using the standard procedures and are stored for the crediting period and an additional two years.

<b>Data/Parameter</b>	TR
Data unit	Units
Description	Confirmation of training or technical support provided
Source of data	The implementing organization keeps record of technical or training support provided to the SHS users
Value(s) applied	Variable has not been considered for calculation
Measurement methods and procedures	IDCOL and POs maintains the information, hard copy records, etc. on training and technical service provided to SHS customers, technicians and other staffs. Copy of these records are maintained at the IDCOL and PO offices. Apart from regular training sessions, POs provides training to every SHS households during its installation. Leaflets, brochures, notices containing instructions on operation and servicing of the SHS is provided to the households.
Monitoring frequency	Continuous
QA/QC procedures	All the training materials provided to POs and households are reviewed / revised periodically for the latest updates by IDCOL
Purpose of data	To cross check and ensure the continuous service support to SHS installations.
Additional comment	Data is collected using the standard procedures and is stored for the crediting period and an additional two years.

### B.5.2. Sampling plan

#### Sampling survey to identify operational SHSs

The project proponent will use the Simple Random Sampling method to determine the number of operating SHS out of the total installed SHSs. The representative sample will be chosen so as to achieve 95% confidence level with +/- 10% error margin.

#### Sample size calculation for the proposed survey

The monitoring survey shall be carried out by grouping of SHSs across the PoA into a single group or number of subgroups. From IDCOL technical specifications<sup>13</sup> and third-party literature<sup>14</sup>, it is clear the SHS performance reduces only very marginally across the years and there is no major difference among SHS of different CPAs and also with respect to the date of installation. SHS performance characteristic remains more or less uniform over the entire period of interest.

Taking the performance of SHS as a grouping criteria, all the SHSs under the PoA can be considered as a single group or number of sub groups (regrouping the SHSs under the PoA), depending upon the requirement during each verification.

The survey approaches is given in below table:

No.	Survey Approach	Sampling Method	Reliability Requirement Confidence/Precision
1	Single survey for all the SHSs belonging to entire PoA (Option A)	Simple Random Sampling	95% confidence level with +/- 10% error margin
2	Sub-grouping of SHSs across the PoA and one survey for each sub-group (Option B)		

Situations may arise where it will be necessary to create two or more sub-groups of SHSs over the entire PoA for the monitoring survey. For example, as of now, CPA implementers, may want to have separate monitoring surveys for their installations. In such cases, all the installations of IDCOL shall be grouped under one sub-group and all of the installations of Grameen Shakti to be under another sub-group.

As the SHSs in each CPA are installed over the entire Bangladesh, the CME cannot, for instance, easily create geographical/regional criteria for sub-grouping.

Ultimately, the grouping of SHSs for monitoring surveys will depend upon the convenience and management requirement. Typical examples of SHS sub-grouping are given in the table below. It shows how the SHSs could be flexibly grouped. These examples are not intended to restrict future subgroupings of SHSs.

#### Sub-grouping – Example 1 (Option A):

Sub-Group	CPA Title	Total SHS installations
I	Single monitoring survey for all SHSs under the PoA	2,806,125

#### Sub-grouping – Example 2 (Option B):

Sub-Group	CPA Title	Total SHS installations
I	Installation of Solar Home Systems in Bangladesh (22/06/2007 to 31/12/2009) by Grameen Shakti	1,108,775
	Installation of Solar Home Systems in Bangladesh (01/01/2011 to 31/12/2011) by IDCOL	
	Installation of Solar Home Systems in Bangladesh (01/01/2012 to 31/12/2012) by Grameen Shakti	
	Installation of Solar Home Systems in Bangladesh (01/01/2013 to 31/08/2013) by Grameen Shakti	
	Installation of Solar Home Systems in Bangladesh (01/09/2013 to 30/04/2014) by IDCOL	
II	Installation of Solar Home Systems in Bangladesh	846,264

<sup>13</sup>Technical Specifications for Solar Home System (SHS), IDCOL Solar program, Technical Standards Committee

<sup>14</sup>Performance of Solar Power Plants In India, Central Electricity Regulatory Commission, February 2011



	(01/01/2010 to 31/12/2010) by Grameen Shakti	
	Installation of Solar Home Systems in Bangladesh (01/01/2012 to 30/06/2012) by IDCOL	
	Installation of Solar Home Systems in Bangladesh (01/01/2013 to 31/08/2013) by IDCOL	
	Installation of Solar Home Systems in Bangladesh (01/09/2013 to 30/04/2014) by Grameen Shakti	
III	Installation of Solar Home Systems in Bangladesh (22/06/2007 to 31/12/2010) by IDCOL	851,086
	Installation of Solar Home Systems in Bangladesh (01/01/2011 to 31/12/2011) by Grameen Shakti	
	Installation of Solar Home Systems in Bangladesh (01/07/2012 to 31/12/2012) by IDCOL	
	Installation of Solar Home Systems in Bangladesh (01/05/2014 to 31/12/2014) by Grameen Shakti	

Sub-grouping – Example 3 (Option B):

Sub-Group	CPA Title	Total SHS installations
I	Installation of Solar Home Systems in Bangladesh (22/06/2007 to 31/12/2010) by IDCOL	1,342,858
	Installation of Solar Home Systems in Bangladesh (01/01/2011 to 31/12/2011) by IDCOL	
	Installation of Solar Home Systems in Bangladesh (01/01/2012 to 30/06/2012) by IDCOL	
	Installation of Solar Home Systems in Bangladesh (01/07/2012 to 31/12/2012) by IDCOL	
	Installation of Solar Home Systems in Bangladesh (01/01/2013 to 31/08/2013) by IDCOL	
	Installation of Solar Home Systems in Bangladesh (01/09/2013 to 30/04/2014) by IDCOL	
II	Installation of Solar Home Systems in Bangladesh (22/06/2007 to 31/12/2009) by Grameen Shakti	1,463,267
	Installation of Solar Home Systems in Bangladesh (01/01/2010 to 31/12/2010) by Grameen Shakti	
	Installation of Solar Home Systems in Bangladesh (01/01/2011 to 31/12/2011) by Grameen Shakti	
	Installation of Solar Home Systems in Bangladesh (01/01/2012 to 31/12/2012) by Grameen Shakti	
	Installation of Solar Home Systems in Bangladesh (01/01/2013 to 31/08/2013) by Grameen Shakti	
	Installation of Solar Home Systems in Bangladesh (01/09/2013 to 30/04/2014) by Grameen Shakti	
	Installation of Solar Home Systems in Bangladesh (01/05/2013 to 31/12/2014) by Grameen Shakti	

The above-mentioned grouping criteria will also apply to all future CPAs to be included. In selection of any of the options, the sample survey will meet the requirement of “Standard for Sampling and surveys for CDM project activities and programme of activities”, Version 09 and “Guidelines for sampling and surveys for CDM project activities and programmes of activities”, version 04, EB 86.

#### Sample size calculation

The procedure to determine the sample size of monitoring survey will ensure that they adequately represent the broader population and minimize the sampling error. Simple random sampling is done to draw a sample of households which will participate in the SHS monitoring survey.

For the selection of sampling method “Guidelines for sampling and surveys for CDM project activities and programmes of activities, Version 04, EB 86” has been referred. The equation to give the required sample size is:

$$n \geq \frac{1.96^2 \times N \times p(1-p)}{(N-1) \times 0.1^2 \times p^2 + (1.96^2 \times p \times (1-p))}$$

- $n$  - sample size  
 $N$  - Total number of household SHS installations  
 $p$  - Expected operational proportion (0.70 i.e., 70% of the units being operational<sup>15</sup>)  
 1.96 - Represent the 95% confidence required  
 0.1 - Represent the 10% relative precision

The value of  $p$  (expected operational proportion) is based on the monthly SHS installation inspection report for the CPA. From the monthly SHS installation inspection reports, it was found that more than 95% of the installed units are operational. However, for conservative reasons, a value of 70% is assumed (for sample size calculation only).

Using the above equation, the sample size calculated for various approaches of monitoring survey is provided as below:

Example	Subgroups	Total population	Estimated sample size	Sample size with 20% non-responsiveness
1	I	2,806,292	165	200
2	I	1,108,775	165	200
	II	846,264	165	200
	III	851,086	165	200
3	I	1,342,858	165	200
	II	1,463,267	165	200

Each household/SHS will be given a number (for example, houses are given a number from 1 to 10 in the population). A number of houses equal to the sample size is selected from the total population randomly using the excel function RANDBETWEEN(). The results of this survey will be transmitted to IDCOL data base and will be stored electronically.

### B.5.3. Other elements of monitoring plan

The monitoring methodology as defined in AMS-I.A - “Electricity generation by the user”, version 17, EB 103 has been applied in this CPA. The methodology options are:

- An annual check of all systems or a sample thereof to ensure that they are still operating (other evidence of continuing operation, such as on-going rental / lease payments could be a substitute); or
- Metering the electricity generated by all systems in a sample thereof.

Option (a) is selected and an annual sampling is carried out to determine the number of operating units under a single group of all SHSs across the PoA or number of sub-groups of SHSs under the PoA, during a monitoring period. Ongoing loan repayment will also be documented to provide additional evidence for continuing operation of the SHS.

<sup>15</sup> Conservative value considered based on the regular random sample inspection carried out by the inspection team

Each installation, in each CPA, is given a clearly distinguishable identification number (agreement code) which links to specific SHS details in the database such as the date of installation, serial number of SHS, owner of the installation, etc. The monitoring plan and procedures are as follows:

1. Follow up of the installation of SHS
  - Monthly to bi-monthly report on the installations completed is provided by the PO to IDCOL.
  - IDCOL Inspectors randomly inspect the newly installed SHS to confirm the technical standards and that the SHS has been installed in a rural area to a non-grid connected household. An Inspection Report is produced. The results of the Inspection Report are fed into the IDCOL data base. If the Inspection Report indicates that a SHS has been installed in conflict with the program eligibility criteria such as, in an urban area or to a grid connected household, a Discrepancy Report is generated. The SHS then becomes ineligible under the program and is accordingly not eligible to receive any IDCOL financing. A clear system exists for excluding ineligible SHS under the program.
2. Monitoring and follow up of the number of operational SHS  
 Number of installed SHSs is reported by O&M team in the unit offices and stored in central database at the IDCOL head office. All the customer details, customer loan and repayment details are maintained in the central database.
  - Loan repayment details and status of recovery of loan is maintained for all SHS customers on the PO records / data base
  - Information/records on training and technical services provided to SHS customers are maintained at the IDCOL/PO offices.
  - IDCOL inspection team monitors and follow up with the SHS units installed in different regions by different POs every month. An inspection summary report is generated, and results are shared with the POs for further corrective actions or follow up with the households.
3. Proper documentation of training materials and other records of technical services provided to SHS consumer by the PO.

All the monitored data are kept for two years after the end of the crediting period or until the last issuance of CERs for this CPA, whichever occurs later.

<b>Data to be collected, stored and monitored</b>	<b>Description of process for data collection storage and monitoring</b>	<b>Means of verification for CDM purposes</b>
Operational SHS	POs report monthly or bi-monthly to IDCOL on all new SHS installations. IDCOL enters this information into the programme / CPA data base. IDCOL undertakes own monthly inspection on reported installations	IDCOL undertakes an annual random sample survey at 95% confidence level and 10% interval based on IDCOL data base
Leakage (lamps and kupies)	Leakage monitoring is not required as per the latest SSC methodology guideline, "General guidelines for SSC CDM methodologies", Version 19.0, EB 69, Annex 27, Section N. Leakage due to transfer of equipment.	Not applicable.
SHS loan repayment details and status of loan recovery from individual households	IDCOL receives this information from POs and maintains it in the CPA data base	As part of the above sample survey, IDCOL (See below) draws information from the database to demonstrate loan repayment and loan recovery details for the randomly selected SHS users
Technical training provided by PO to SHS consumer	POs provide training and technical support during SHS installation and thereafter as part of the agreement with	Documentation provided by IDCOL or POs to households

	SHS consumers. The individual SHS PO consumer agreements are retained at PO level onsite. Maintenance support is captured in the IDCOL data base	
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The result of this survey is transmitted to IDCOL data base and i stored electronically. Refer Appendix 5 for more information on monitoring plan and structure.

## **SECTION C. Start date, crediting period type and duration**

### **C.1. Start date of CPA**

01/09/2013

Start date of the CPA is taken as the date of first activity under the CPA, which is the start date of installation of SHS units under this CPA. The SHS purchase agreement between the consumer and the respective PO will serve as the proof of evidence for the start date of CPA.

### **C.2. Expected operational lifetime of CPA**

25 years and 0 months

### **C.3. Crediting period of CPA**

#### **C.3.1. Type of crediting period**

Renewable crediting period

#### **C.3.2. Start date of crediting period**

01/05/2021 is the start date of the crediting period. This is the second crediting period of the CPA.

#### **C.3.3. Duration of crediting period**

The length of the 2<sup>nd</sup> crediting period is 7 years and 0 months.

- As per the registered PoA, the PoA start date is 22/06/2007. PoA validity period is 28 years, i.e., up to 21/06/2035.
- Operational lifetime of the CPA is 25 years.
- The length of crediting period will be restricted to 21/06/2032 in line with the CPA's lifetime.

Thus, the total length of crediting period for this CPA is within validity period of PoA and the lifetime of the CPA.

## **SECTION D. Environmental impacts**

### **D.1. Analysis of environmental impacts**

Environmental analysis is done at PoA level as the installation of SHS is a routine predictable activity which is beneficial to the environment and the individual CPAs are small scale activities. The activity therefore benefits from environmental analysis at the PoA level. Please refer to section E.2 in Part I of the PoA-DD.

### **D.2. Environmental impact assessment**

According to the National Environmental Policy 1992, Environmental Conservation Act 1995 and Environmental Conservation Rules and Regulation 1997, a project dealing with solar energy does not require any environmental clearance certificate for implementation. Therefore, there are no requirements for carrying out Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA). CPAs will thus not be accompanied by environmental analysis.

## SECTION E. Local stakeholder consultation

### E.1. Modalities for local stakeholder consultation

Stakeholder consultation activity was carried out at the PoA level and information on solicitation of comments from local stakeholders is provided in the PoA DD Part I section F.1.

### E.2. Summary of comments received

Stakeholder consultation activity was carried out at PoA level and the summary of the comments received from the local stakeholders is provided in PoA DD Part I section F.2.

### E.3. Consideration of comments received

Stakeholder consultation activity was carried out at PoA level and the report on how due account was taken of any comments received is provided in PoA DD Part I section F.3.

## SECTION F. Eligibility for inclusion

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
1	The proposed CPA should have access to financing channels of the IDCOL Solar Energy Programme  (Each proposed CPA implementer, other than IDCOL itself, should be an approved participant of the IDCOL Solar Energy programme).	The IDCOL Participation Agreement will be used to demonstrate that the CPA Implementer is an approved participant of the IDCOL Solar Energy Programme. Articles III and IV of the Participation Agreement make it clear that POs are eligible to receive IDCOL financing.	Signed IDCOL Participation Agreement.	Signed IDCOL Participation Agreement has been submitted to confirm that the CPA Implementer is an approved participant of the IDCOL Solar Energy Programme. Articles III and IV of the Participation Agreement make it clear that POs are eligible to receive IDCOL financing
2	The CPA should be confined to the self-generation of electricity, by the end user, from SHS technology.	The CPA DD should state that the CPA is confined to the self-generation of electricity by the end user from SHS technology.	Section A.5 of the CPA DD provides the specification of the project technology that involves installation of small SHS units	Section A.5 of the CPA DD provides the specification of the project technology that involves installation of small SHS units to generate power and use for home appliances 12 only (bulb and TV). Hence it is confirmed that CPA is confined to the self-generation of electricity by the end user from SHS as described in section A.6 of PoA.
3	At the time of CPA inclusion, the installation of SHS is not required by law in Bangladesh.	Confirmation by third party that SHS use is not mandated by law in Bangladesh.	Appropriate Third-party letter DNA provided a letter dated April 20, 2011 confirming that SHS is not mandated by law in Bangladesh.	Appropriate third-party letter stating SHS is not mandated by law in Bangladesh.
4	The proposed CPA must be within the country of Bangladesh,	Confirmation that the specific CPA and all households /SHS	Section A.2 of the CPA DD provides a Map of the CPA indicating that	The geographical boundary of this CPA is same as the boundary

	which is an LDC	consumers planned to be included in it are located within the boundaries of Bangladesh.	the CPA is confined to the boundaries of Bangladesh and hence, all CPA SHS consumers.	of the PoA i.e., Bangladesh. The boundary is clearly depicted in section A.2 of this CPA-DD. The location of each SHS will be available at the time of verification.
5	The proposed SHS customers in the specific CPA must be households / communities / SMEs and located in rural areas and not have grid connected electricity at time of SHS installation.	(i) IDCOL Participation Agreement. Section 1.01 (hh) of the Participation Agreement defines the "Subproject Areas" as "Subproject areas means (1) geographical areas outside the grid electrification master plan of REB; (2) areas that do not qualify for grid electrification based on the revenue ratio criteria of REB; (3) remote households not qualified for grid electrification services by PBS; and (4) islands disconnected from the mainland; and isolated pocket areas, etc."	IDCOL Participation Agreements.	IDCOL Participation Agreements stipulate this requirement.
6	The start date of any specific CPA-DD shall be in accordance with EB 47 para 72 requirements and shall be no earlier than 22/06/2007.	Section A.8.1 of the CPA shall indicate a CPA start date of no earlier than 22/06/2007.	Signed IDCOL Participation Agreement	Section A.8.1 of CPA DD says the start date is 01/09/2013
7	The CPA is required to install SHS that meet the minimum standards as approved by the technical standards committee established by the Co-ordinating Entity. (Approved Solar Equipment)	Copy of the most recent minute from the SHS Committee indicating that it is actively setting standards for the whole SHS programme.  IDCOL Participation Agreement requires POs to purchase SHS from the accredited suppliers.	1. Minutes of standard setting committee. 2. Signed IDCOL agreement	1. Copy of recent minutes of the standards setting committee.  2. Signed IDCOL Participation Agreement Section 3.04 A, makes it clear that approved supplier equipment is required to be installed.
8	Each SSC-CPA and the SHS installed shall be uniquely identified and defined in an unambiguous manner by providing geographic information, and the year of installation covered.	The CPA will describe its geographic location and duration for which it is applicable.  Screenshot of IDCOL data base which confirms that IDCOL is maintaining a unique identification number for	Screen shot of IDCOL database	Section A.7 of the specific CPA DD describes the geographic location of the CPA (Bangladesh).  A Screenshot of the IDCOL data base shows that IDCOL is maintaining a data

		each SHS in the SHS programme corresponding to the name of beneficiary, date of installation, location and CPA.		base, which lists the said requirements: SHS unique identification number, beneficiary name, date of installation and location.
9	Planned total installed capacity is within the small scale limits of 15 MW installed capacity (as per Report Annex 20, EB 41, "Indicative Simplified baseline and monitoring methodologies for selected small scale CDM project activity categories") and each of the independent subsystems / measures in the project is planned to be <=15 MW.	<p>Total planned installed SHS capacity for the specific CPA is below threshold as per calculations spreadsheet.</p> <p>Section D.5 Table 3 of CPA indicates that each subsystem is planned to be &lt;=15 MW</p>	CER Spread sheet	<p>CER calculations spreadsheet for the CPA show that the total installed capacity is less than 15 MW.</p> <p>As per the new CPA format, section D.5 Table 3 of CPA indicates that the rating of independent subsystems and the total installed capacity under this CPA is &lt;=15 MW.</p>
10	Conditions to avoid double counting of GHG emission reductions or net anthropogenic GHG removals, such as unique identifications of product and end user locations	<ul style="list-style-type: none"> <li>Prior to seeking an entry of a new SSC-CPA under the proposed PoA, IDCOL will check the UNFCCC and database to confirm that no stand-alone CDM project activity or CPA of another SHS PoA (if registered) has already been registered or entered under another SHS PoA.</li> <li>As it is proposed to uniquely identify each SHS installed under the Program, IDCOL will also check the database of already registered CPAs to check any inclusion of SHSs registered as part of any other CPA and exclude any such cases from the said CPA. It will also check to ensure that no SHS is included in 2 CPAs. Each installation entry in the data base will show under which</li> </ul>	IDCOL Database	IDCOL database confirmed that the SHS of this project is not part of any GHG removal project. Further, no other similar technology project from Bangladesh is registered in CDM.

		<p>CPA it falls.</p> <ul style="list-style-type: none"> <li>The DOE requested to enter new CPAs will also verify the above.</li> </ul>		
11	<p>Conditions to confirm that CPAs are neither registered as CDM project activities, included in another registered PoAs, nor the project activities that have been deregistered</p>	<ul style="list-style-type: none"> <li>Prior to seeking an entry of a new SSC-CPA under the proposed PoA, IDCOL will check the UNFCCC and database to confirm that no stand-alone CDM project activity or CPA of another SHS PoA (if registered) has already been registered or entered under another SHS PoA.</li> <li>The DOE requested to enter new CPAs will also verify the above.</li> </ul>	IDCOL Database	<p>IDCOL database has confirmed that the SHS systems of this CPA is not any stand-alone CDM project activity or CPA of another SHS PoA (if registered) has already been registered or entered under another SHS PoA.</p>
12	<p>Sampling for the determination of parameter values for calculating GHG emission reductions or net anthropogenic GHG removals, conditions related to sampling requirements for the PoA in accordance with the "Standard: Sampling and surveys for CDM project activities and programme of activities"</p>	<p>Sampling of the program activity to be carried out as described in section B.5.2. of this document</p>	CER Calculation sheet	<p>CPAs will follow sampling procedure as Described in section B.5.2.</p>
13	<p>If the generic CPA is small-scale or microscale, conditions to ensure that CPAs that will be included meet the small-scale or microscale thresholds and remain within those thresholds throughout the crediting period of the CPAs. However, if the generic CPA consists solely of units that qualify as "microscale CDM units" as defined in the "Methodological tool: Demonstration of additionality of microscale project</p>	<p>Threshold check is not applicable as per se Threshold check is not applicable as per section I.2 of POA-DD</p>	<p>CER Calculation sheet &amp; Table 4 of this document</p>	<p>Not Applicable for this CPA but the same has been demonstrated in Table 4 &amp; CER calculation sheet</p>



	activities”, these conditions are not required;			
14	If the generic CPA is small-scale or microscale, conditions for the debundling check based on the “Methodological tool: Assessment of debundling for small-scale project activities”. However, if the generic CPA consists solely of units that qualify as “microscale CDM units”, these conditions are not required.	De-bundling check is not applicable as per section I.2 of PoA-DD.	Not Applicable	Not Applicable

Table 4. SHS units installed in the year 2011 in relation to small scale threshold limit

No.	Capacity of installed SHS (Wp)	No. of installations	Total capacity installed (MW)
1	20	108,491	2.16982
2	21	22	0.00046
3	30	50	0.00150
4	35	3,053	0.10686
5	40	42,853	1.71412
6	45	14,128	0.63576
7	50	50,595	2.52975
8	55	601	0.03306
9	60	3,448	0.20688
10	65	18,258	1.18677
11	70	270	0.01890
12	74	4	0.00030
13	75	4,758	0.35685
14	80	846	0.06768
15	85	23,133	1.96631
16	90	2,131	0.19179
17	100	363	0.03630
18	120	296	0.03552
19	125	5	0.00063
20	130	26	0.00338
21	140	1	0.00014
22	160	1	0.00016
	<b>Total</b>	273,333	<b>11.26292 (&lt;15 MW)</b>

The key barriers identified at time of program design being:

- Investment barrier
- Technical barriers
- Institutional and regulatory barriers

In order to confirm the demonstration of additionality of the CPA through the eligibility criteria and to demonstrate existence and applicability of above-mentioned barriers derived from all the relevant requirements of Attachment A of Appendix B of the Simplified modalities and procedures for small-scale CDM project activities, the following criteria have been checked and confirmed in eligibility criteria table above of the CPA via eligibility criteria no. (1), (4) and (5).

- The proposed CPA should have access to financing channels of the IDCOL Solar Energy Programme
- The proposed CPA must be within the country of Bangladesh which is an LDC
- The proposed SHS customers in the specific CPA must be households / communities / SMEs and located in rural areas and not have grid connected electricity at time of SHS installation.

As the CPA meets all three above mentioned conditions per the eligibility criteria (1), (4) and (5) in the above table, the CPA is deemed to be considered additional.

In addition, given that it is already demonstrated through other means in Section C of Part I of the PoA- DD that the programme itself, and as such the implementation of SHS targeted households in areas of no grid, are additional, there is no further requirement for demonstration of additionality for each CPA, as long as the eligibility conditions prescribed in above eligibility criteria are met.

## Appendix 1. Contact information of CPA implementers

<b>Organization name</b>	Infrastructure Development Company Limited (IDCOL)
<b>Country</b>	Bangladesh
<b>Address</b>	8 Panthapath Kawranbazaar, UTC Building, Bhaka, Bangladesh
<b>Telephone</b>	9114385, 8111235, 9143157 Ext 20
<b>Fax</b>	+880 - 28116663
<b>E-mail</b>	<a href="mailto:nhaque@idcol.org">nhaque@idcol.org</a>
<b>Website</b>	<a href="http://www.idcol.org">www.idcol.org</a>
<b>Contact person</b>	Mr. Haque Nazmul

## Appendix 2. Affirmation regarding public funding

No ODA or public funding has been diverted for this project.

External funding is provided to the Government of Bangladesh which is then provided to the programme. For good measure, letters have been provided from the 2 key sources confirming that such funding does not constitute a diversion of ODA.

The World Bank Group which includes the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA) has provided financing to Government for the programme through the solar home system component of the Rural and Renewable Energy Development Programme.

KfW has provided financing to the programme as well.

Non diversion of ODA letters have been provided during the PoA Validation process

## Appendix 3. Further background information on ex ante calculation of emission reductions

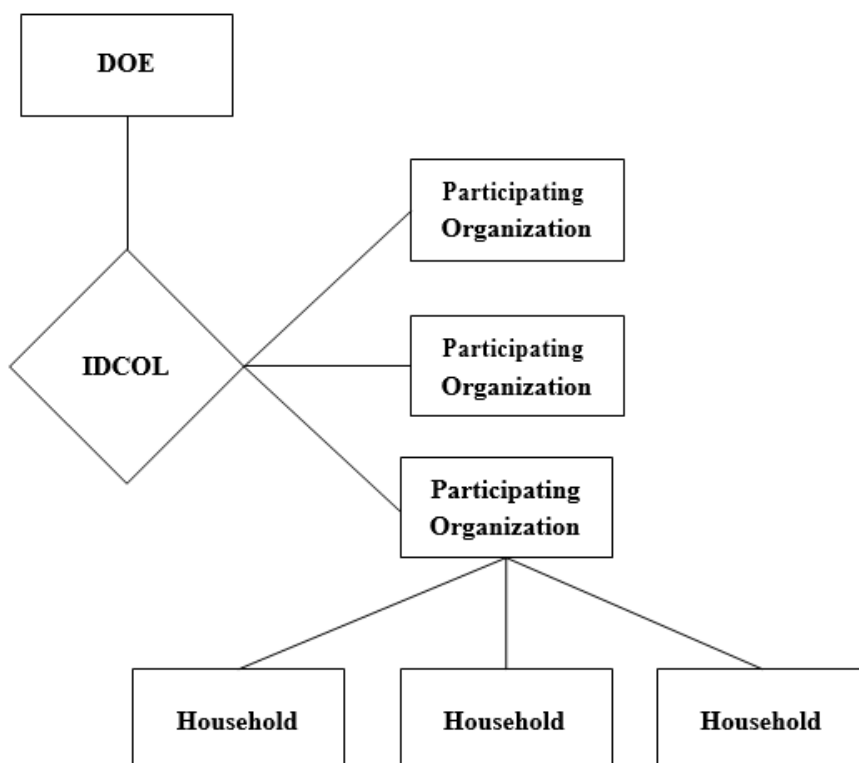
Refer section B.4.1.1

## Appendix 4. Further background information on monitoring plan

Programme and CPA level monitoring are undertaken as follows:

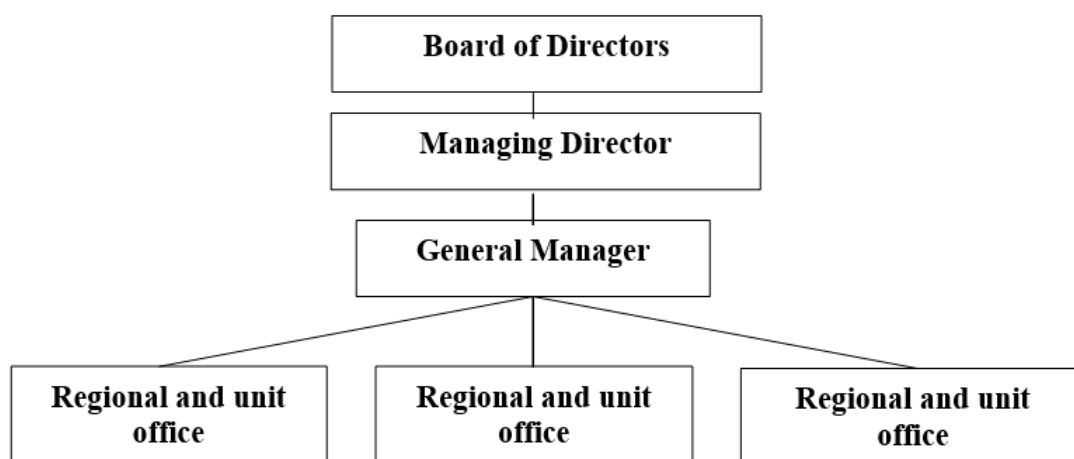
On PoA level;

The monitoring structure on PoA level is demonstrated below. The POs collect data and report to the next higher entity.



Organizational and Management Structure of the POs:

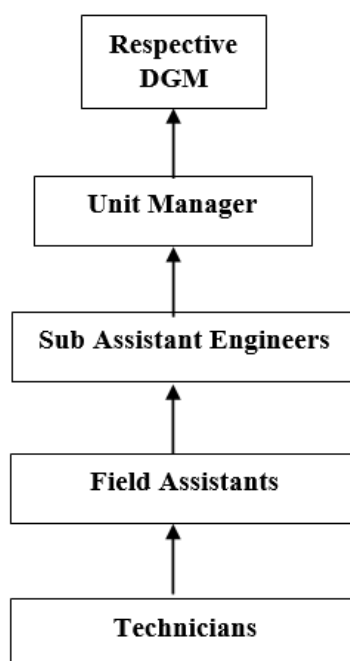
POs reports to IDCOL on number of SHS installed. The structure of a typical PO is as below. Regional / unit offices are responsible for collecting ground level data which is ultimately provided to IDCOL on regular monthly basis. Generic ground level support and management of POs is indicated below.



#### Monitoring and reporting:

At the grassroots level, a unit office is responsible for undertaking installations, maintenance, monitoring and reporting. One unit office have 4-7 staff which includes 1 Unit Manager, 1-2 Sub-Assistant Engineers, 2-3 Field Assistants & 1-2 Technicians.

The organizational and monitoring structure in the typical unit office of PO is shown below:



For installation of the SHS, the PO signs an agreement (using a specific format) with the customer, giving all the relevant information, including system capacity, price, mode of payment, location / address of customer, etc. A copy of the sale agreements is collected every month by the head office from the unit office. Based on the sale agreement, the PO inserts the information into their electronic information database at their head office under middle to senior management direct supervision.

At the unit-office level, the staff is in close touch with the SHS customers, as they periodically (about once in every month) visits the customers' houses both to collect the instalments and to attend to any servicing requirements.

The unit office prepares a report on the monthly SHS installations and dispatch it to the head office. A report detailing the sales, installations, loan recovery and maintenance are prepared every month under senior middle / senior management direct supervision at the POs' regional office and provided to IDCOL. IDCOL enters data into the overall data base for the CPA.

### **Technical Service:**

After three years of free maintenance, the customer has the option to enter into an "agreement for maintenance & servicing" with the PO. In case there is no O & M agreement with the user, the PO charges the user on a service call basis. POs educate the SHS-client families and provides "Technician Training" to the young men & women of the local community. In case of technical problems in the long run, these certified technicians of the PO services the complaints.

## **Appendix 5. Summary report of comments received from local stakeholders**

Kindly refer section E of the CPA-DD.

## **Appendix 6. Summary of post-registration changes**

Not Applicable

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**Document information**

<i>Version</i>	<i>Date</i>	<i>Description</i>
09.0	31 May 2019	Revision to: <ul style="list-style-type: none"> <li>• Ensure consistency with version 02.0 of the “CDM project standard for programmes of activities” (CDM-EB93-A07-STAN);</li> <li>• Make editorial improvements.</li> </ul>
08.1	20 October 2017	Editorial revision to remove appendix “Applicability of methodologies and standardized baselines” from the main part of the form which had been mistakenly kept in the previous version.
08.0	28 June 2017	Revision to: <ul style="list-style-type: none"> <li>• Remove appendix “Applicability of methodologies and standardized baselines” as the appendix is not relevant at the CPA level;</li> <li>• Make editorial improvement.</li> </ul>
07.0	7 June 2017	Revision to: <ul style="list-style-type: none"> <li>• Improve consistency with the “CDM project standard for programmes of activities” and with the PDD and PoA-DD forms;</li> <li>• Make editorial improvement.</li> </ul>
06.0	24 May 2017	Revision to: <ul style="list-style-type: none"> <li>• Ensure consistency with the “Standard: CDM project standard for programme of activities” (CDM-EB93-A07-STAN) (version 01.0);</li> <li>• Incorporate the “Component project activity design document form for small-scale component project activities” (CDM-SSC-CPA-DD-FORM);</li> <li>• Make editorial improvement.</li> </ul>
05.0	15 April 2016	Revision to ensure consistency with the “Standard: Applicability of sectoral scopes” (CDM-EB88-A04-STAN) (version 01.0).
04.0	9 March 2015	Revision to: <ul style="list-style-type: none"> <li>• Include provisions related to statement on erroneous inclusion of a CPA;</li> <li>• Include provisions related to delayed submission of a monitoring plan;</li> <li>• Provisions related to local stakeholder consultation;</li> <li>• Provisions related to the Host Party;</li> <li>• Make editorial improvement.</li> </ul>
03.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> <li>• Include the Attachment: Instructions for filling out the component project activity design document form for CDM component project activities (these instructions supersede the "Guidelines for completing the component project activity design document form" (Version 01.0));</li> <li>• Include provisions related to standardized baselines;</li> </ul>

<i>Version</i>	<i>Date</i>	<i>Description</i>
		<ul style="list-style-type: none"> <li>• Add contact information on a CPA implementer and/or responsible person/ entity for completing the CDM-CPA-DD-FORM in A.13. and Appendix 1;</li> <li>• Add general instructions on post-registration changes in paragraph 4 and 5 of general instructions and Appendix 6;</li> <li>• Change the reference number from F-CDM-CPA-DD to CDM-CPA-DD-FORM;</li> <li>• Make editorial improvement.</li> </ul>
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the component project activity design document form" (EB 66, Annex 16).
01.0	27 July 2007	EB 33, Annex 42 Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Registration Keywords: component project activity, project design document		