Validation report form for renewal of crediting period of component project activities

(Version 03.0)

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

BASIC INFORMATION			
Title and UNFCCC reference number of the programme of activities (PoA)	Solar Water Heater Program in India UNFCCC Ref No: 8855		
Version number of the validation report	02		
Completion date of the validation report	28/04/2020		
Version numbers of PoA-DD to which this report applies	11		
Title and UNFCCC reference number of each CPA for renewal	**CPA Ref. no.**	**Title**	
	CPA-1	Solar Water Heater Program in India-"CPA-1"	
Sectoral scopes for each CPA	**CPA Ref. no.**	**Sectoral scopes (indicate mandatory and conditional sectoral scopes)**	
	CPA-1	01: Energy Industries	
Applied methodologies and standardized baselines for each CPA	**CPA Ref. no.**	**Applied methodologies and standardized baselines**	
	CPA-1	AMS.I.C./Version 21. Thermal energy production with or without electricity	
Number and duration of the next crediting period (CP)	**CPA Ref. no.**	**No. of CP**	**Duration of the CP**
	CPA-1	2	01/02/2020 – 31/01/2027
Coordinating/managing entity (CME)	Nuetech Solar Systems Pvt. Ltd		
Host Parties	India		
Estimated amount of annual average greenhouse gas (GHG) emission reductions or GHG removals by sinks in the next crediting period (tCO_2e), per CPA	**CPA Ref. no.**	**Annual emission reductions or removals (tCO_2e)**	
	CPA-1	33,236	
Name and UNFCCC reference number of the DOE	4K Earth Science Private Limited UNFCC Ref No: E-0069		
Name, position and signature of the approver of the validation report	S. Jagajothi  Director		

SECTION A. Executive summary

4K Earth Science Pvt. Ltd. has been contracted by 'Nuetech Solar Systems Pvt. Ltd' to perform a validation of the CPA-1 under the registered PoA 'Solar Water Heater Program in India' (UNFCCC Ref #8855) in India for renewal of the crediting period of the CPA.

The scope of the validation is defined as an independent and objective review of the revised CPA design document including assessment of CPA inclusion criteria, project's baseline study and monitoring plan and other relevant documents. The information in these documents is reviewed against the CDM validation and verification standard for Programme of activities (version 02), CDM project cycle procedure for programmes of activities (version 02) and CDM project standard for programmes of activities (version 02), Kyoto Protocol requirements and UNFCCC rules.

The report is based on the assessment of the revised CPA design document undertaken through stakeholder consultations, application of standard auditing techniques including but not limited to desk review, follow up actions (e.g., on site visit, electronic (telephone or e-mail) interviews) and also the review of the applicable approved methodological and relevant tools, guidance and CDM decisions.

The CPA involves installation of Solar water heating systems (SWH) in residential as well as commercial buildings throughout India. The CPA avoids electricity generated from fossil fuels intensive grid power plants by using renewable energy to meet hot water requirement and will result in reduction of CO_2 emissions.

The review of the CPA design documentation and the subsequent follow-up interviews have provided 4KES with sufficient evidence to determine the project's fulfillment of all the stated criteria. In our opinion, the CPA meets all applicable UNFCCC requirements for the CDM PoA & CPA.

☒The CPA will be recommended to the CDM Executive Board with a request for renewal of crediting period.
☐The CPA is not recommended for renewal of crediting period

SECTION B. Validation team, technical reviewer and approver

B.1. Validation team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interviews	Validation findings
1.	Team Leader and Technical Expert	IR	Kumar	Narendra	Central office	X	X	X	X
2.	Local Expert	IR	S R	Anand	Central office		X	X	

B.2. Technical reviewer and approver of the validation report for RCP

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer	IR	Puratchikkanal	Ma Paa	Central office
2	Approver	IR	Jagajothi	S	Central Office

SECTION C. Means of validation

C.1. Desk/document review

The report is based on the assessment of the CPA design document undertaken through stakeholder consultations, application of standard auditing techniques including but not limited to desk review, follow up actions (e.g., on site visit, electronic (telephone or e-mail) interviews) and also the review of the applicable approved methodological and relevant tools, guidance and CDM decisions.

All the documents used for arriving validation conclusion are listed in Appendix 03 and referenced accordingly in validation report.

C.2. On-site inspection

Duration of on-site inspection: 02/11/2019 to 03/11/2019				
No.	**Activity performed on-site**	**Site location**	**Date**	**Team member**
1.	Opening Meeting	Nuetech office	02/11/2019	Narendra Kumar R Anand SR
2	Visit to sampled of households of CPAs	Beneficiary households	02/11/2019 & 03/11/2019	Narendra Kumar R Anand SR
3	Document review & Closing meeting	Nuetech office	03/11/2019	Narendra Kumar R Anand SR

C.3. Interviews

No.	**Interviewee**			**Date**	**Subject**	**Team member**
	Last name	**First name**	**Affiliation**			
1.	B	Prakash	Nuetech	02/11/2019 & 03/11/2019	- Roles and responsibilities - End user agreement - Technical details - Revised baseline - Revised monitoring requirement - Revised CPA inclusion criteria - Stakeholder consultation process	NKR & ASR
2	T	Ananth	Nuetech	02/11/2019 & 03/11/2019		
3	Padmanabha	Sudha	FCN	02/11/2019 & 03/11/2019	- Revised Baseline assessment - Issues in the PDD - Latest methodology application - Revised CPA inclusion criteria - Revised ER estimation	NKR & ASR
4	K	Yuvaraj	Beneficiary	02/11/2019	- Monitoring procedure - Data collection - Repair & maintenance	NKR & ASR
5		Bhagya		02/11/2019		
6	Murthy	Brugu		02/11/2019		
7	N V	Manjula		02/11/2019		
8		Jaya		02/11/2019		
9	A C	Gangappa		02/11/2019		
10		Hemalatha		02/11/2019		
11	V	Sahana		02/11/2019		
12		Lakshmamma		02/11/2019		
13	Chabbi	Renuka		02/11/2019		
14		Baby		03/11/2019		
15		Bagyamma		03/11/2019		
16	H T	Jagadeesh		03/11/2019		
17		Lakshmipathi		03/11/2019		

18	N	Naveen kumar		03/11/2019		
19	K N	Satisha		03/11/2019		
20		Vasantha Kumara		03/11/2019		
21	N	Swamy		03/11/2019		
22		Saraswati		03/11/2019		
23		Vijayalakshmi		03/11/2019		
24		Sunanda		03/11/2019		

C.4. Sampling approach

The validation team used acceptance sampling approach for checking the installation status of SWH. A sample size of 18 was required, based on an AQL of 0.5% and UQL of 20%, the producer risk used is 5% and consumer risk used was 10%.

In accordance with the Table on page no.11 of standard "Sampling and surveys for CDM project activities and programmes of activities"/11/, version 08.0. However, the validation team visited 21 households. It was observed that all the SWH visited were in working condition and no discrepant records were observed with the CPA-DD and sampling record sheet. Thus PP's set of records has been accepted in line with § 30 of the sampling standard, version 08

C.5. Clarification requests (CLs), corrective action requests (CARs) and forward action requests (FARs) raised

Area of validation findings (SECTION D)	No. of CL	No. of CAR	No. of FAR
CPAs to be renewed and corresponding generic CPAs	-	-	-
Compliance with CPA-DD form	-	-	-
Application and selection of methodologies and standardized baselines	-	1	-
Validity of original baseline or its update	-	-	-
Demonstration of eligibility of the CPAs	1	1	-
Estimated emission reductions or net anthropogenic removals	-	4	-
Validity of monitoring plan	3	1	-
Crediting period	-	1	-
CME and project participants	-	-	-
Post-registration changes	-	-	-
Others (please specify)	-	-	-
Total	4	6	-

SECTION D. Validation findings

D.1. CPAs to be renewed and corresponding generic CPAs

Title and UNFCCC reference number of the CPA	Version number of the CPA-DD	Host Party	Title and reference number of the corresponding generic CPA	Version number of the PoA-DD on which the RCP is based
Solar Water Heater Program in India- "CPA-1" Ref No: 8855-P1-0001	Version 11	India	Solar Water Heater Program in India- "CPA-X"	Version 10

D.2. Compliance with CPA-DD form

Means of validation	Validation team checked the CPA Design Document with latest version of 'Component project activity design document form' in the UNFCCC website (ie, version 09.0)/9/ and "Instructions for completing this form" mentioned as attachment to CPA design document form (version 09.0)/9/.
Findings	No finding
Conclusion	Validation team confirms that final CPA-DD is completed using the valid version of the applicable CPA-DD form at the time of submission.

D.3. Application and selection of methodologies and standardized baselines

Means of validation	The CPA applies the approved methodology, "AMS.I.C. Thermal energy production with or without electricity, Version 21". All the applicability criteria as per methodology are included in the CPA DD and validation team confirms that all the applicability criteria are met.
Findings	CAR-02 is raised and closed successfully.
Conclusion	The validation teams confirms that approved methodology: AMS.I.C-Thermal energy production with or without electricity, Version 21[/6/] is applicable to the PoA and this CPA. All applicability conditions of the applied methodology are been met and the CPA design is in line with all the requirements indicated in the methodology. Related eligibility criteria with respect to the applicability of the methodologies have been established and met by the CPA.

D.4. Validity of original baseline or its update

Means of validation	Validation team checked the approved CPA-DD (of 1st CP) and the revised CPA-DD submitted for the validity of original baseline or its update. The baseline of the project activity is continued use of the systems (electric geyser) that were used before the implementation of the SWH system. Hence, the baseline emission is estimated based on the parameters grid electricity avoided due to the project activity and the emission factor of grid. As per para 382 of CDM Validation and Verification standard for programmes of activities (version 2), validity of the original baseline or its update is assessed as below: a) As per the CPA-DD, the only baseline parameter which can be affected by changed in policies and circumstances is 'CO_2 emission factor of the Indian grid'. The grid emission factor takes into consideration the impact of: • All the new relevant mandatory national and/or sectoral policies, including the Electricity Act 2003, National Electricity Policy and Tariff Policy and all the respective State Governments' and state regulatory commissions' policies on Renewable Energy Sector; and • Any changes in circumstances or conditions, for example, change in market characteristics, the availability of fuels for power generation or raw materials for developing new power generation capacity as well as the impact of electricity or fuel prices. However as per the first approved CPA-DD & the revised CPA-DD, the baseline parameter 'CO_2 emission factor of the Indian grid' is an ex-post parameter and no other data or parameters are used for determining the original baseline, that were determined ex-ante are sensitive to changes in policies or circumstances. All the ex-ante fixed parameters are constants or default parameters. Hence, no update of the ex-ante parameter is required during this renewal of crediting period. However, as required by "Tool to calculate emission factor of an electricity system' v7, the build margin emission factor should be fixed ex-ante for the 2nd crediting period. Hence the parameter 'Build Margin for Second Crediting Period' is included as an ex-ante parameter in the CPA-DD. b) The latest methodology AMS I.C, version 21 is applied correctly in the determination of the updated baseline and the estimation of GHG emission reductions for the applicable PoA period. The methodology AMS I.C, version 21 refers the latest version of the 'Tool to calculate emission factor of an electricity system' in estimation of baseline parameter 'CO_2 emission factor of the Indian grid'. Since, the parameter is an ex-post parameter, in the monitoring parameter table it is mentioned that the parameter will be determined based on the latest version of the methodological tool to calculate the emission factor for an electricity system. Also for the ex-ante calculation the CME used Tool to calculate the emission factor for an electricity system Version 07.0 for the emission factor calculation which is the latest available tool.

Findings	No finding
Conclusion	The only baseline parameter affecting the baseline emission that is sensitive to changes in policies and circumstances is 'CO_2 emission factor of the Indian grid'. However, this parameter is ex-post monitoring parameter; not an ex-ante fixed parameter. Hence, no update on this parameter required. However, "Tool to calculate emission factor of an electricity system' v7, ex-post option requires to fix build margin emission factor ex-ante for the 2nd crediting period. Hence the parameter 'Build Margin for Second Crediting Period' is included as an ex-ante parameter in the CPA-DD. Since no other baseline parameter is fixed ex-ante which is sensitive to changes in policies and circumstances, updating of baseline parameter is not required during the renewal of crediting period. This is in line with para 291 of the CDM Project standard for PoA, version 2 The latest methodology and tools are applied correctly for determination of the updated baseline and the estimation of GHG emission reductions for the applicable PoA period

D.5. Demonstration of eligibility of the CPAs

Means of validation

No	Eligibility criteria	Means of Validation
1	All SWH listed in the proposed SSC-CPA must be within the geographical boundary of India.	The project location in the project database/17/ and the Invoices/15/ of SWHs for CPA-1 are verified and assessment team conclude that the all the SWH are implemented within the geographic boundary of India
2	The technology used under the proposed SSC-CPA consists of a solar energy based water heating system.	The technical details mentioned in the CPA-DD is checked and found that only solar water heating technology is included in the CPA. The assessment team checked "Test reports of FPC and EPC" /16/ and found that the technology used in CPA-1 is water heating by solar energy.
3	The aggregated surface of the collectors of all systems in the CPA should not exceed 64,000 m^2.[1]	In the CPA 1 database, the surface area of the each solar water heating system is provided. The database/17/ is checked and found that the total surface area of the SWHs in the CPA 1 is 59,412 m^2 which is less than 64,000 m^2.
4	The SSC-CPA follows the baseline and monitoring methodology AMS-I.C. version 21 and should meet its eligibility criteria as discussed in section B.2. of Part II.	The assessment team checked revised ER Calculations Sheet/2/, CPA-DD/1/ and found that CPA-1 meets the eligibility criteria of AMS-I.C. Version 21. The CPA includes only solar water heater technology and as per the CPA-1 database the total surface area of the SWHs in the CPA 1 is 59,412 m^2 which is less than 64,000 m^2.

[1] Value obtained from Annex 3 of the Small Scale Working Group (SSC WG) Meeting 07.

			Hence the CPA meets relevant requirements of the applied baseline & monitoring methodology AMS-I.C, version 21.
	5	The SWH collector area of an individual system should not be more than 640 m^2.	The validation team based on calculations in ER Calculations Sheet/2/ & database/17/ and discussion with PP/site personnel during the visit found that the SWH installed under CPA-1 with the largest collector area is of 104 m^2, which is below 640 m^2.
	6	Confirmation that this SSC-CPA, nor any of its SWH systems is not yet registered and not being registered as a standalone CDM project by ensuring that the CPA has the full title over the emission reductions generated by the SWH users listed in the CPA. To confirm this, all owners of the SWH systems in the CPA should have transferred the title to the emission reductions to the CME, either directly or through the CPAI.	The assessment team based on calculations in ER Calculations Sheet/2/ and discussion with PP/site personnel during the visit found that the Hard copies of signed invoice/15/ by the end-user has the following clause. "Each participant to the CPA-1 has confirmed in writing that they transfer the title to the emission reductions to the Nuetech Solar Systems Pvt. Ltd. which is also the CME".
	7	Each SWH in the SSC-CPA shall be uniquely identified and defined in an unambiguous manner by providing the address, and/or the system serial number of the collectors installed at each location.	The assessment team checked the Database of CPA-1 supported by invoices/15/ and guarantee cards/18/ for SWHs and found that the database/17/ with SWH in CPA-1 lists the address of the all installation.
	10	The start date of the CPA is not after the date of delivery or construction of the first SWH installed. Documented evidence is available to confirm that date. For example an invoice, installation or delivery form	Invoice of the SWH installed on 02/07/2007/15/ From the CPA1 database, it is found that the earliest invoice date for a SWH in the CPA-1 is 02/07/2007. That is the day of the start date of the CPA-1. The invoice is verified by the assessment team and found to be correct.
	11	The CPA is additional according to the criteria for confirmation of additionality for its inclusion into the PoA in section C.	Each of the independent SWHs in the project activity is smaller than 4500kW as can be seen from the sales register, dealers invoice or end user agreement for the units listed in the excel sheet "CER calculations CPA-1". The highest installed capacity is 0.07 MW_{th} or 70 kW_{th} (equivalent energy of 104 m2 surface area). The end users of the SWHs are residential households or SMEs as can be seen from the sales register, dealers' invoices or end

			user agreement for the units listed in database "CER calculations CPA-1". The assessment team checked project database and found that the all the SWH installed till date are at households, communities and SMEs. Hence, it fullfills the Option 2: Micro-scale additionality criteria as described in the PoA-DD.
	12	A confirmation that no funding from Annex 1 parties has been used for this CPA or that, if used, this did not result in a diversion of official development assistance.	The CME has provided a confirmation letter[14] confirming that no ODA funding is involved in the CPA-1 and CPA-DD also confirms the same. The same is verified and found to be ok.
	13	Stakeholder consultations can be organised for a group of CPAs if they can be demonstrated to be in similar geographic areas and time (start of construction/ implementation within the same two years), similar socio-economic situations, identical activity or technology etc.	This is renewal of the crediting period. Hence, conducing LSC meeting is not applicable. Stakeholder's consultation was conducted for CPA-01 on 14th December 2009, the details of which were provided during the first crediting period.
	14	Leakage is not relevant since there is no energy generating equipment transferred from outside the project boundaries and no second-hand installations will be used in the project.	Validation team checked the invoices randomly and found that all the equipments used in the project are new equipments. No second-hand equipments used in CPA-1. Also confirmation by Nuetech Solar Systems Pvt. Ltd has been provided that no second hand equipments used in the project.
Findings	CL-04 & CAR-07 are raised and closed successfully		
Conclusion	The compliance and fulfilment on the established CPA inclusion criteria as mentioned in the registered PoA-DD have been justified in section. F of the CPA-DD. Hence the validation team confirms that all eligibility criteria are justified with appropriate evidences.		

D.6. Estimated emission reductions or net anthropogenic removals

Means of validation	The validation team checked whether the equations and parameters used to calculate GHG emission reductions or net anthropogenic GHG removals for CPA is in accordance with registered PoA-DD and applied methodology. Validation team checked section B.4.3 of the CPA-DD to confirm whether all formulae to calculate baseline emissions, project emission and leakage have been applied in line with the underlying methodology. **BASELINE EMISSION:** As per formula (3) in the methodology AMS-I.C, version 21 applies, the baseline emission will be calculated as below: $BE_{thermal,CO2,y} = \sum_{n=1}^{n=N} \frac{EG_{thermal,n,y}}{\eta_{BL,thermal}} \times EF_{FF,CO2,y}$

In which:

$BE_{thermal, CO2,y}$	The baseline emissions from steam/heat displaced by the project activity during the year y (tCO_2e/year)
$EG_{thermal,y}$	The net quantity of steam/heat supplied by the project activity during the year y (GJ/year)
$\boldsymbol{EF_{FF,CO2,y}}$	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant obtained from reliable local or national data, if available, alternatively, IPCC default emission factors can be used. (tCO_2e /GJ) Since the project displaces grid electricity, the grid emission factor of India has been considered
$\eta_{BL,thermal}$	The efficiency of the plant using fossil fuel that would have been used in the absence of the project activity

Since the electricity is used to generate thermal energy in the baseline condition using electric water heater, the project will replace the grid electricity. Hence, as per the CPA-DD submitted, the formula for baseline emission is modified as below (considering both category I & category II systems):

$$BE_{thermal,CO2,y} = \sum_{n=1}^{n=N} \frac{EG_{thermal,n,y,catI}}{\eta_{EWH}} \times EF_{grid,y} + \sum_{n=1}^{n=N} \frac{EG_{thermal,n,y,catII}}{\eta_{EWH}} \times EF_{grid,y}$$

In which:

$EF_{grid,y}$	The CO_2 emission factor of the Indian grid (tCO_2e /MWh)
$EG_{thermal,n,y,\ CAT\ I,}$	The net quantity of steam/heat supplied by the project activity from Category I systems during the year y (MWh/year)
$EG_{thermal,n,y,\ CAT\ II,}$	The net quantity of steam/heat supplied by the project activity from Category II systems during the year y (MWh/year)
η_{EWH}	The efficiency of an electric water heater
N	Total number of the SWH systems

The formula is verified and found to be appropriate for estimation of baseline emission of the CPA and in line with the requirements of PoA-DD and applied methodology AMS-I.C, version 21.

The $EG_{thermal,}$ for category I system will be estimated applying any one of the methods mentioned below based on the relevant data availability:

<u>Method 1</u>
This method shall be used if output temperature data available (either from test result or MNRE criteria).

$$EG_{thermal,n,y,catI} = \frac{V_{catI,n}(T_{out}-T_{in})\times S_{op}\times D\times C_w}{F\times 1000}$$

Where

$\boldsymbol{V_{catI,n}}$	Amount of water heated daily in the CPA by Category I system n (m^3/day)
$\boldsymbol{T_{in}}$	Average input temperature (K)
$\boldsymbol{T_{out}}$	Average output temperature (K)
$\boldsymbol{S_{op}}$	Share of systems confirmed to be operational
$\boldsymbol{D}$	Number of operational days in year y (days/year)
$\boldsymbol{C_w}$	Specific Heating Capacity of water (default value is 4.1855) (J/g/K)
$\boldsymbol{F}$	Conversion factor from MJ to kWh (factor is 3.6 MJ/kWh)

<u>Method 2:</u>
This method shall be used if Average amount of energy collected per system is

available (either from test result or MNRE criteria).

$$EG_{thermal,n,y,catI} = \frac{V_{catI,n} \times Q_n \times S_{op} \times D}{100} \quad (4)$$

Where

$V_{catI,n}$	Amount of water heated daily in the CPA by Category I system n (m^3/day)
Q_n	Average amount of energy collected by the SWH during a Thermal Performance Test at day-time under standard conditions for 100litre water (kWh/day/100l)
S_{op}	Share of systems confirmed to be operational
D	Number of operational days in year y (days/year)

Validation team checked the formula provided to estimate $EG_{thermal}$ for category system and found to be appropriate and in line with the methodological requirement.

For category II system, $EG_{thermal,}$ will be monitored directly by installing BTU meter at the systems. Validation team find this approach to be appropriate and in line with the methodological requirements.

PROJECT EMISSION:
Validation team checked the project emission approach provided in the CPA-DD. As per the CPA-DD, the project emission from the electricity consumption will be estimated for the system which is equipped with an electric pump for a forced flow of fluid in the collector as below:

$$PE_{EC,y,n,II} = \sum_{n=1}^{N} EC_{PJ,n,y} \times EF_{grid,y} \times (1 + TDL_y)$$

Where

$PE_{EC,y,n,II}$	Project emissions from electricity consumption by category II system n from the grid during the year *y* (tCO_2e/year)
$EC_{PJ,n,y}$	Quantity of electricity consumed by the Category II system n in year *y* (MWh/year)
TDL_y	Average technical transmission and distribution losses for providing electricity to the category II system (%)

This formula for estimation of project emission is found to be appropriate and in line with registered PoA-DD and "TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", version 3.

LEAKAGE:
As per the applied methodology "Leakage is relevant if equipment is the energy generating equipment is being transferred from outside the project boundaries". However only new SWH are considered in the CPA. No second hand equipments will be used. Hence, leakage is not applicable for the CPA.

EMISSION REDUCTION
As per the CPA-DD, the emission reduction is estimated as below:

$ER_y = BE_y - (PE_y + LE_y)$

Where

ER_y	Emission reductions by the project activity during a given year *y* (tCO_2e/year)
BE_y	Baseline emissions of the project activity during the year *y* (tCO_2e/year)
PE_y	Project emissions of the project activity during the year y (tCO_2e/year)

LE_y Leakage emissions in the year y (tCO_2e/year)

The formula is correct and in line with the PoA-DD and applied methodology.

Ex-ante calculation

The assessment team checked how the baseline methodology, any corresponding tools where applicable, whether the standardized baseline were applied correctly to calculate baseline, project and leakage GHG emissions as well as GHG emission reductions or net anthropogenic GHG removals, is in accordance with the applicable validation requirements in the VVS PoA and the PS PoA

The ex ante calculation is demonstrated in ER sheet and validated by assessment team and found to be in line with the methodology.

Baseline emission:
Method 2 is considered fo the estimation of both $EG_{thermal,n,y,catI}$ and $EG_{thermal,n,y,catII}$ for the ex-ante calculation. Source of the parameter values used for the ex ante calculation are given below:

Parameter	Justification of selection of source
VcatI,n	Taken from CPA1 database. Hence OK.
Qn	Estimated based on the thermal performance test report of the SWH system (ie, FPC: 4.6 kWh/day/100l ETC: 3.17kWh/day/100l). Hence OK.
Sop	Value of 100% is assumed which is found to be appropriate for the ex-ante calculation.
D	Value of 280 days considered which is found to be appropriate for the ex-ante calculation considering number of sunny days in India.
η_{EWH}	Default value of 100% is considered. Hence, OK.
$EF_{grid,n,y}$	This will be estimated based on the latest CO_2 Baseline Database for the Indian Power Sector User Guide published by Central Electricity authority as per the tool to calculate emission factor of an electricity system. • Operating margin will be estimated ex-post based on the latest CEA database value. This is in line with para 42 (b) of tool to calculate emission factor of an electricity system,v7 • Build margin is fixed ex-ante (ie, 0.8811 tCO2/MWh) as per para 72 (b) of tool to calculate emission factor of an electricity system,v7 For the ex-ante calculation the Value of 0.9029 tCO_2/MWh has been considered for $EF_{grid,n,y}$. The calculation is verified and found to be as per CEA database, v15 which is calculated based on tool to calculate emission factor of an electricity system, v7.

The baseline emission is estimated to be *33,237 tCO_2e which is verified and found to be correct.*

Project emission:
Only one SWH installation with pump is included in the CPA-1 that have the total capacity of 5,000 litre/day. The capacity of the pump is 0.7 kW. The parameter values considered for the ex-ante project emission calculation is as below:

Parameter	Justification of selection of source
$EC_{PJ,n,y}$	0.88 MWh considered based on the capacity of pump of 0.7 kW and daily operating hours of 4.5 hrs & annual operating days of 280 days. This is found to be

		acceptable for the ex-ante calculation.
	TDL_y	Default value of 20% has been considered. Hence OK.
	$EF_{grid,n,y}$	This will be estimated based on the latest CO_2 Baseline Database for the Indian Power Sector User Guide published by Central Electricity authority as per the tool to calculate emission factor of an electricity system. • Operating margin will be estimated ex-post based on the latest CEA value. This is in line with para 42 (b) of tool to calculate emission factor of an electricity system,v7 • Build margin is fixed ex-ante (ie, 0.8811 tCO2/MWh) as per para 72 (b) of tool to calculate emission factor of an electricity system,v7 For the ex-ante calculation the Value of 0.9029 tCO_2/MWh has been considered for $EF_{grid,n,y}$. The calculation is verified and found to be as per CEA database, v15 which is calculated based on tool to calculate emission factor of an electricity system, v7.
	D	Value of 280 days considered which is found to be appropriate for the ex-ante calculation considering number of sunny days in India.
	η_{EWH}	Default value of 100% is considered. Hence, OK.
	The project emission is estimated to be *0.9556 tCO_2e (rounded up to 1 tCO_2e) which is verified and found to be correct.* *Leakage emission:* As explained above, there is no leakage emission for the CPA 1 *Emission reduction:* As per the CPA DD the emission reduction is estimated as below: $ER_y = BE_y - (PE_y + LE_y)$ $= 33,237 – (1+0) = 33,236$ tCO_2	
Findings	CAR-01, CAR-04, CAR-05 & CAR-08 are raised and closed successfully	
Conclusion	Validation team confirm that the algorithms and formulae proposed to calculate project emissions, baseline emissions, leakage and emission reductions in the CPA-DD is in line with the requirements of the registered CPA-DD and selected methodology AMS I.C, version 21. For ex-ante calculation, the assessment team confirms that • All assumptions and data used by the project participants are listed in the CPA DD, including their references and sources; • All documentation used by project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the CPA DD; • All values used in the CPA DD are considered reasonable in the context of the proposed CPA. • The applied formula and methods for calculating ER are in accordance with the monitoring plan of the registered POA-DD and applied methodology and • All calculations are complete and without any omissions.	

D.7. Validity of monitoring plan

Means of validation	Validation team checked whether existing monitoring plan followed during the 1st crediting period monitoring the plan is still valid for the 2nd crediting period or not. Validation team checked the monitoring plan provided in the revised CPA-DD and crosschecked with the monitoring plan provided in the CPA-DD of 1st crediting period. Validation team also checked whether the monitoring plan provided in the revised CPA-DD is in consistent with requirements of the applied methodology (AMS I.C,

version 21).

The information provided in the CPA-DD has been found in compliance with the information evaluated during the site visit, while interviewing with the concerned people and the same was re-affirmed through the documentary evidence.

The monitoring plan described in the CPA-DD is in compliance with the applied methodology and PoA-DD. The assessment team has reviewed all the parameters in the monitoring plan against the requirements of the applied methodology and confirmed that monitoring parameters are applied in line with the requirement of the methodology and relevant in the context of the program. The procedures have been reviewed by the assessment team through document review and interviews with the respective department's personnel. The information provided has allowed the assessment team to confirm that the proposed monitoring plan is feasible within the project design. The relevant points of monitoring plan have been discussed with the CME. Specifically, these points include the monitoring methodology, data management, and the quality assurance and quality control procedures to be implemented in the context of the project. Therefore, the CME will be able to implement the monitoring plan and the achieved emission reductions can be reported ex-post and verified.

The parameters that are fixed ex-ante are:

Parameter	**Value**	**Source**
Build Margin Emission factor (Build Margin for Second Crediting Period)	0.8811 tCO2/MWh	Based on latest CO_2 Baseline Database for the Indian Power Sector User Guide, Version 15.0, December 2019
$V_{catl,n}$ **(**Aggregated amount of water heated daily in each CPA by Category I system n)	FPC - 2,113 m^3 ETC - 1,074 m^3	CPA-1 database
η_{EWH} **(**Efficiency of an electric water heater system)	100%	Methodology default value (AMS-I.C., version 21, paragraph 43.)
TDL_y **(**Average technical transmission and distribution losses for providing electricity to the category II system**)**	20%	Default value (TOOL05 "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (Version 03.0), page 14.)
T_{in} **(**Average Input temperature**)**	NA	Not applicable as method II is selected
T_{out} **(**Average output temperature**)**	NA	Not applicable as method II is selected
C_w (Specific Heating Capacity of water)	4.1855 J/g/K	Constant value
F (Conversion factor from MJ to KWh)	3.6 MJ/KWh	Conversion factor
Q_n **(**Average amount of energy collected by the SWH during a Thermal Performance Test at day-time under standard conditions for 100litre water**)**	FPC: 4.6 kWh/day/100l ETC: 3.17 kWh/day/100l	Thermal performance test reports of the SWH systems

The parameters that are to be monitored ex-post are:

	<table><tr><th>Parameter</th><th>Monitoring Details</th></tr><tr><td>**D** (Number of operational days in year y)</td><td>The parameter will be monitored though sample survey annually among the SWH users of the CPA-1.</td></tr><tr><td>S_{op} (Share of systems confirmed to be operational)</td><td>The parameter will be monitored though sample survey annually among the SWH users of the CPA-1.</td></tr><tr><td>$EG_{thermal, CAT II,y}$ (The aggregated amount of thermal energy generated by SWH category II unit n in year y (MWh))</td><td>This parameter will be monitored continuously though BTU meters installed at the category II systems.</td></tr><tr><td>$EC_{PJ,n,y}$ Quantity of electricity consumed by the Category II system n in year y)</td><td>This parameter will be monitored continuously though Energy meters installed at the category II systems which are equipped with pumps.</td></tr><tr><td>$EF_{grid,y}$ (The CO_2 emission factor of the Indian grid)</td><td>This parameter will be determined based on the latest CO_2 Baseline Database for the Indian Power Sector User Guide published by Central Electricity authority as per the tool to calculate emission factor of an electricity system.</td></tr></table> The monitoring plan content has been checked in the generic CPA and compared against the requirements of the monitoring methodology All means of implementing the monitoring plan are in line with the applied and monitoring methodology. The validation team has no doubts that the monitoring arrangements as it is already implemented during the first crediting period itself as described in the CPA-DD. **Sampling plan:** The CPA-DD indicates a sampling plan as per the recommendation outlined in ‘Guideline for Sampling and Surveys for CDM Project Activities and Programme of Activities, version 04’ (which also has normative reference to Sampling Standard, version 08) has been referred. Assessment team confirms that the sampling method (stratified sampling) is clearly described and is in line with the description of the population. The sampling plan transparently describes how the samples will be selected. CME also demonstrates how Stratified Sampling is suitable for the CPA and basis for the stratification also provided. The CME also provided formula for sample size calculation and reliability requirements in line with the sampling guidelines.
Findings	CL-01, CL-02, CL-03 & CAR-03 raised and closed
Conclusion	The validation team confirms that the monitoring plan based on the approved monitoring methodology, is included in the CPA-DD and is correctly applied to the CPA. The monitoring plan has been found to be in compliance with the requirements of the applied methodology and the PoA-DD. The monitoring plan will give opportunity for real measurements of achieved emission reductions. The validation team considers that monitoring arrangements described in the monitoring plan is feasible within the project design.

D.8. Crediting period

Means of validation	The validation team checked whether the CME specified the Start date & duration of the 2nd crediting period which is in accordance with the applicable requirements in the VVS PoA and the PS PoA. The details provided in the CPA-DD are: • Start date of crediting period: 01/02/2020 • Length of crediting period: 7 years

	The end date of the 1st crediting period is 31/01/2020 and the renewal of crediting period is submitted within 1 year from the end of 1st crediting period. Hence, considering the start date of 2nd crediting period for the CPA 1 as 01/02/2020 is appropriate.
Findings	CAR-06 is raised and closed successfully.
Conclusion	The start dates and the crediting period type & length have been validated and found to be in accordance with VVS PoA and the PS PoA.

D.9. CME and project participants

Means of validation	As per the Section A.4 of the CPA-DD, the Coordinating and Managing entity of the PoA is 'Nuetech Solar Systems Pvt. Ltd'. As per the Section A.4 of the CPA-DD, the project participants of the CPA are 'Nuetech Solar Systems Pvt. Ltd' and Carbonbay GmbH & Co. KG. The names of the CME and project participants are checked and found to be in consistent with the in the latest version of the MoC statement available in the UNFCCC website.
Findings	No finding
Conclusion	The names of CME & PP mentioned in the CPA-DD are in consistent with the latest PoA-DD and latest version of MoC available in the UNFCCC website. Hence, it is in line with the requirements of para 294 of the 'CDM project standard for programmes of activities', version 2

D.10. Post-registration changes

Type of post-registration changes (PRCs)	Confirmation (Y/N)	Validation report for PRCs	
		Version	**Completion date**
Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents[2]	N	NA	NA
Corrections	N	NA	NA
Changes to the start date of the crediting period of component project activity	N	NA	NA
Inclusion of monitoring plan	N	NA	NA
Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from applied methodologies, standardized baselines, or other methodological regulatory documents	N	NA	NA
Changes to the project design	N	NA	NA
Changes specific to afforestation and reforestation activities	N	NA	NA
Others (please specify)	N	NA	NA

SECTION E. Internal quality control

The validation report prepared by team leader is reviewed by an independent technical reviewer (having competence of relevant technical area himself/herself or through an independent technical area expert) to confirm the internal procedures established by 4KES are duly followed and the validation report/opinion is reached in an objective manner and complies with the applicable CDM requirements.

The technical review team is collectively required to possess the technical expertise of all the technical area/sectoral scope the project activity relates to. All team members of technical review team are independent of the validation team. The independent technical reviewer(s) may approve or reject the draft validation report. The findings may be identified even at this stage, which needs to be satisfactorily resolved, before submit final report to UNFCCC. The final approval decision is taken by the Head of the DOE/Director.

[2] Other standards, methodologies, methodological tools and guidelines (to be) applied in accordance with the applied(selected) methodologies are collectively referred to as the other (applied) methodological regulatory documents).

The final decision is authorized by the Director, 4KES, once the report is finalized by the Head of the DOE/DOE Manager.

SECTION F. Validation opinion

4K Earth Science Private Limited has been contracted by 'Nuetech Solar Systems Pvt. Ltd' to undertake validation of renewal of crediting period of CPA-1 (UNFCCC Ref# 8855-P1-0001**)** to the registered PoA 'Solar Water Heater Program in India' (UNFCCC Ref #8855) in India for renewal of program of activities period.

The validation was performed in accordance with the UNFCCC criteria for the Clean Development Mechanism, latest version of Validation and Verification Standard and related Standards/Guidance and host country criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting. In our opinion, the project meets all relevant UNFCCC, CDM criteria and all relevant host country criteria.

The review of the final CPA-DD and the subsequently performed follow-up interviews with representatives of the project participant has provided the validation team with sufficient evidence to determine the validity of the original baseline and/or its update of the CPA. The CPA design document correctly applies small scale methodology AMS-I.C. Version 21.0. It is demonstrated that the project baseline scenario is not changed and also all necessary parameters are updated correctly for the 2nd crediting period.

The monitoring plan provides for the monitoring of the CPA emission reductions. The monitoring arrangements described in the monitoring plan are feasible within the program design, and it is the validation team's opinion that the CME and CPA implementer are able to implement the monitoring plan.

The CPA fulfills all the revised eligibility criteria given in the PoA-DD (submitted for 2nd PoA period). The justification and supporting documents submitted are adequate to confirm the fulfillment of the eligibility criteria.

The revised ex-ante emission reduction from the CPA is estimated to be 33,236 tCO_2 per year or 232,652 tCO_2 for the entire crediting period of 7 years.

In summary, it is validation team's opinion that the CPA-1 under the PoA 'Solar Water Heater Program in India' (UNFCCC Ref #8855) in India meets all relevant UNFCCC requirements for the renewal crediting period of the CPA. Hence 4KES requests the renewal of the crediting period of the CPA.

Appendix 1. Abbreviations

Abbreviations	Full texts
4KES	4K Earth Science Private Limited
AMS	Approved Methodology for Small-scale
BE	Baseline Emissions
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CL	Clarification request
CME	Coordinating/ Managing Entity
CPA	Component of the Project Activity
CPAI	Component of the Project Activity Implementer
CO_2	Carbon dioxide
COP	Conference of Parties
DOE	Designated Operational Entity
DNA	Designated National Authority
DR	Document Review
EB	Executive Board
EF	Emission Factor
ERs	Emission Reductions
ETC	Evacuated Tube Collector
FAR	Forward Action Request
FCN	Fair Climate Network
FPC	Flat Plate Collector
GHG	Greenhouse gas(es)
HCA	Host Country Approval
IPCC	Intergovernmental Panel on Climate Change
KP	Kyoto Protocol
LSC	Local Stakeholder Consultation
LE	Leakage Emissions
LoA	Letter of Approval/Authorization
ISO	International Organization for Standardization
MNRE	Ministry of New & Renewable Energy
MOP	Meeting of Parties
MoC	Modalities of Communication
MoV	Means of Verification
MP	Monitoring Plan
NCV	Net Calorific Value
ODA	Official Development Assistance
PA	Project Activity
PoA	Program of Activity
DD	Design Document
PE	Project Emissions
PP	Project Participant
PS	Project Standard
PCP	Project Cycle Procedure
QA/QC	Quality Assurance/Quality Control
RCP	Renewal of Crediting period
SDG	Sustainable Development Goal
SSC	Small Scale
SWH	Solar Water Heater
T&C	Technical & Certification
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Validation & Verification Standard

Appendix 2. Competence of team members and technical reviewers

Certificate of Competence							
Name	☒ Mr. ☐ Ms.	**Ma Paa Puratchikkanal**					
Qualification Procedure		*Fulfils the requirement as per the appointment of personnel procedure of 4KES for Validation and Verification of CDM/VCS/GS/GHG Projects.*					
Appointed to work as:							
		CDM Validator/Verifier	**Team Leader**	**Team Member**	**Technical Expert**	**Technical Reviewer**	**Financial Expert**
Appointed		Yes	Yes	Yes	Yes	Yes	No
Appointed Date		29-07-2019					
Authorized to work as Technical Expert for:							
Authorized Technical Area		**Sectoral Scope**		**TA Code**	**Technical Area within the scope**		
		Energy industries (renewable - / non-renewable sources)		1.1	Thermal energy generation		
		Energy industries (renewable - / non-renewable sources)		1.2	Renewables		
		Energy demand		3.1	Energy demand		
		Construction		6.1	Construction		
		Waste handling and disposal		13.1	Solid waste and wastewater		
		Agriculture		15.1	Agriculture		
Authorized to work as Local Expert for:							
Country/Countries		India					
Compliance check by: Anand S. R.							

Certificate of Competence							
Name	☒ Mr. ☐ Ms.	**Narendra Kumar .R**					
Qualification Procedure		*Fulfils the requirement as per the appointment of personnel procedure of 4KES for Validation and Verification of CDM/VCS/GS/GHG Projects.*					
Appointed to work as:							
		CDM Validator/Verifier	**Team Leader**	**Team Member**	**Technical Expert**	**Technical Reviewer**	**Financial Expert**
Appointed		Yes	Yes	Yes	Yes	Yes	No
Appointed Date		29-07-2019					
Authorized to work as Technical Expert for:							
Authorized Technical Area		**Sectoral Scope**		**TA Code**	**Technical Area within the scope**		
		Energy industries (renewable - / non-renewable sources)		1.1	Thermal energy generation		
		Energy industries (renewable - / non-renewable sources)		1.2	Renewables		
		Energy demand		3.1	Energy demand		

	Waste handling and disposal	13.1	Solid waste and wastewater
Authorized to work as Local Expert for:			
Country/Countries	India		
Compliance check by: Anand S. R.			

Certificate of Competence

Name	☒ Mr. ☐ Ms.	**Anand S.R**
Qualification Procedure		*Fulfils the requirement as per the appointment of personnel procedure of 4KES for Validation and Verification of CDM/VCS/GS/GHG Projects.*

Appointed to work as:

	CDM Validator/Verifier	Team Leader	Team Member	Technical Expert	Technical Reviewer	Financial Expert
Appointed	No	No	Yes	No	No	No
Appointed Date	29-07-2019					

Authorized to work as Technical Expert for:

Authorized Technical Area			
Authorized to work as Local Expert for:			
Country/Countries	India		

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1	Nuetech	Updated CPA Design Document	Version 09, dated 19/08/2019	Nuetech
	Nuetech	Revised CPA Design Document	Version 10, dated 07/10/2019	Nuetech
	Nuetech	Revised CPA Design Document	Version 11, dated 14/04/2020	Nuetech
2	Nuetech	Revised ER Estimation sheet of CPA-1 Revised ER Estimation sheet of CPA-1 (Public version without confidential information)	Version 7	Nuetech
3	Nuetech	PoA-DD submitted to UNFCCC (for the 2nd CP)	Version 11, dated 12/02/2020	Publically available
4	4KES	RCP Validation Report of PoA	Version 2, dated 14/02/2020	Publically available
5	Nuetech	Latest Modalities of communication		Publically available
6	UNFCCC	AMS.I.C – "Switch from Non-Renewable Biomass for Thermal Applications by the User"	Version 21	Publically available
7	IPCC	1. 1996 IPCC Guidelines for National Greenhouse Gas Inventories: work book 2. 2006 IPCC Guidelines for National Greenhouse Gas Inventories: work book	Web Link	Publically available
8	UNFCCC	Kyoto Protocol (1997)	Web Link	Publically available
9	UNFCCC	Component of project activity design document form	Version 09	Publically available
10	UNFCCC	CDM Project Standard for programmes of activities	Version 02	Publically available
11	UNFCCC	Standard: Sampling and surveys for CDM project activities and programme of activities	Version 08	Publically available
	UNFCCC	Guidelines for sampling and surveys for CDM project activities and programme of activities	Version 04	Publically available
12	UNFCCC	CDM Validation and Verification Standard for programmes of activities	Version 02	Publically available
13	UNFCCC	Glossary "CDM terms"	Version 10	Publically available
14	Nuetech	ODA Declaration letter		Nuetech
15	Nuetech	Invoices of solar water heater included in the CPA1		Nuetech
16	Regional Test Centre (Solar Thermal) of Madurai Kamaraj University	(FPC) Test Report, (RTC file no 730)	Dated 18/07/2011	Nuetech
		(ETC) Test Report, (RTC file no 730)	Dated 18/07/2011	Nuetech
17	Nuetech	CPA 1 database		Nuetech
18	Nuetech	Manufacturer guarantee cards of SWH		Nuetech
19	UNFCCC	Tool to calculate the emission factor for an electricity system	Version 7	Publically available
20	UNFCCC	Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation	Version 3	Publically available
21	CEA	CEA CO2 baseline database	Version 15	Publically available

Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 1. CL from this validation

CL ID	01	**Section no.**	D.7	**Date:** 07/11/2019
Description of CL				
Few parameters in CPA-DD that needs to be monitored as per the methodology are considered as fixed parameters. Clarification is sought. • The parameter $EG_{thermal,\ CAT\ II,y.}$ is monitored by measuring the flow of hot water and temperature difference of the cold & hot water**.** So, the volume of hot water for the category II system is measured using BTU meter. However, the parameter volume of hot water for the category II system ($V_{catII,n}$**)** is also mentioned under fixed parameters. • The parameter $EF_{grid,y}$ is a monitoring parameter but the same is also considered in the fixed parameters.				
CME response				**Date:** 12/11/2019
Let us respond to the two bullets separately: • *The parameter $V_{catII,n}$ has been removed from section B.4.2. 'Data and parameters fixed ex ante'. This parameter is indeed already covered by the monitoring parameter $EG_{thermal,\ CAT\ II,y.}$.* • *The fixed parameter $EF_{grid,y}$ is indeed a monitoring parameter. It appeared in the fixed parameters since it is an important value in the ex ante calculations. The fixed parameter has been deleted and the ex ante value has been added to the equivalent monitoring parameter. For the ex ante calculations latest CO_2 emission factor of the Indian grid has been used. Since this is the 2nd crediting period, wOM=0.25 and wBM= 0.75 has been applied, following TOOL07 Methodological tool: Tool to calculate the emission factor for an electricity system Version 07.0, paragraph 86.*				
Documentation provided by CME				
Revised CPA-DD *Spreadsheets: 2017-18 Emission Factor Version 14*				
DOE assessment				**Date:** 15/11/2019
• The parameter $V_{catII,n}$ is now removed from the fixed parameter list. Hence Ok. • The parameter $EF_{grid,y}$ is removed from the fixed parameter list. Hence Ok CL is closed				

CL ID	02	**Section no.**	D.7	**Date:** 07/11/2019
Description of CL				
As per methodology, the parameter $EG_{thermal,y}$ should be determined *"...as the difference of the enthalpy of the steam or hot fluid and/or gases generated by the heat generation equipment and the sum of the enthalpies of the feed-fluid and/or gases blow-down and if applicable any condensate returns. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure."* But for the category I solar water heating systems, the mass flow and the temperature are not monitored but fixed ex-ante. This is a deviation from the methodology. Clarification is sought.				
Project participant response				**Date:** 12/11/2019
Category I systems are an exception to this rule. The methodology stipulates in paragraph 82, the first parameters that "In the case of household or commercial applications/systems, whose maximum output capacity is less than 45 kW thermal and where it can be demonstrated that the metering of thermal energy output is not plausible:" *The guidance which applies to systems with a capacity below 45 kW thermal has been applied to category I systems.*				
Documentation provided by project participant				
Revised CPA-DD, dated 7 October, 2019				
DOE assessment				**Date:** 15/11/2019

As per the Data / Parameter table 1 of para 82 in the methodology, In the case of household or commercial applications/systems, whose maximum output capacity is less than 45 kW thermal and where it can be demonstrated that the metering of thermal energy output is not plausible and monitor number of operating days of the system instead. Since the SWH Category I system capacity is less than 45 kW thermal, PP monitors the operating days of the system. Hence, no requirement of monitoring $EG_{thermal,y}$ for category I system.

CL is closed.

CL ID	03	**Section no.**		**Date:** 07/11/2019
Description of CL				
Under Section B.5.2 of CPA-DD, it is mentioned that 'The number of systems operating' is a monitoring parameter. But the same is not considered under monitoring parameters table under B.5.1. Clarify				
CME response				**Date:** 12/11/2019
The methodology AMS-I.C, v21, para 82 refers to monitoring the continuous operation of the systems. To systems smaller than 45 kW thermal, an exception applies. For these systems, survey methods can be used to determine the number of systems operating, and the annual hours of operation. In the CPA-DD, parameter D is mentioned under section B.5.1 and elaborated in the sampling plan in section B.5.2 of the CPA-DD. Although the methodology refers to a single monitoring parameter with two elements (paragraph 82, 1st parameter), the amended CPA-DD now specify two separate parameters: *1. Number of operational days in year y* *2. Share of systems confirmed to be operational*				
Documentation provided by project participant				
CPA-DD, dated 7 October				
DOE assessment				**Date:** 15/11/2019
PP now included the share of operating system as monitoring parameter. Hence, OK. CL is closed.				

CL ID	04	**Section no.**		**Date:** 07/11/2019
Description of CL				
PP is requested to clarify the mechanisms put it place to avoid double counting of project equipments. In particular, clarify unique numbering system proposed for each solar water heater installed under the CPA-1				
Project participant response				**Date:** 12/11/2019
Each SWH in the SSC-CPA shall be uniquely identified and defined in an unambiguous manner by providing the address, and/or the system serial number of the collectors installed at each location. *The address and serial numbers should be collected at completion of the sales agreement and invoice and entered into the centralised database. Data entry for serial numbers can easily be checked for repetition by ranking on serial numbers.* *For each SWH there are either address or serial numbers included in the database. Nuetech is in the process of renovating unique serial numbers which have become less readable over the years.*				
Documentation provided by project participant				
-				
DOE assessment				**Date:** 15/11/2019
The unique numbering system explained by CME has been verified by validation team during the site visit. During site visit, address & serial number given in the database has been cross verified by physically inspecting the solar water heating system randomly. During the interview with CME, the CME confirmed that Nuetech will rewrite the serial number in the SWH systems which have become less readable. Hence, verification confirms the mechanisms to avoid double counting that put in place by CME is adequate. CL is closed.				

Table 2. CAR from this validation

CAR ID	01	**Section no.**	D.6	**Date:** 07/11/2019
Description of CAR				
The information regarding the different category of Solar water heating system is not clear in the CPA-DD. Several places in the CPA-DD the Category I & Category II SWH systems are referred. But these categories are not defined anywhere in the CPA-DD.				
Project participant response				**Date:** 12/11/2019
That is correct. This explanatory section has accidently been removed when transposing the CPA-DD to the latest UNFCCC template. *The two categories were introduced of the previous version of the CPA-DD. We have resolved this by adding an explanation to section B.4.1 of the CPA-DD*				
Documentation provided by project participant				
CPA-DD for CPA01, dated 7 October, section B.4.1.				
DOE assessment				**Date:** 15/11/2019
The definition of both category I & category II system are now included in section B.4.1 of the CPA-DD CAR is closed.				

CAR ID	02	**Section no.**	D.3	**Date:** 07/11/2019
Description of CAR				
Latest version of methodology and tools are not referred in the CPA-DD. • Under the fixed parameter table of η_{EWH}, AMSI.C Version 12 is referred which is not a valid version. • Under the monitoring parameter table of $EF_{grid,y}$, Tool to calculate emission factor for electricity systems, version 02 is referred which is not a valid version.				
Project participant response				**Date:** 12/11/2019
These are omissions and both have been corrected.				
Documentation provided by project participant				
CPA-DD, dated 7 October, section B.5.1.				
DOE assessment				**Date:** 15/11/2019
• The reference to the AMS I.C version 12 has been updated to AMS I.C version 21. • Also the Tool to calculate emission factor for electricity systems, version 02 has been updated to version 07. CAR is closed				

CAR ID	03	**Section no.**	D.7	**Date:** 07/11/2019
Description of CAR				
Monitoring frequency of the parameter $EC_{PJ,n,y}$ is not in line with the applied Tool 05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 3) requirements. • Monitoring frequency is not mentioned in the CPA-DD • The recording frequency considered in the CPA-DD is yearly; but as per the Tool 05, the minimum required monitoring frequency is every month.				
Project participant response				**Date:** 12/11/2019
The description of the monitoring frequency has been corrected as Continuous measurement and at least monthly recording, reflecting the requirements of Tool05, version 03.0.				
Documentation provided by project participant				
CPA-DD for CPA01, dated 7 October, section B.5.1				
DOE assessment				**Date:** 15/11/2019
The monitoring and recording frequency of the parameter $EC_{PJ,n,y}$ is now changed to Continuous measurement and at least monthly recording. This is found to be in line with the Tool 05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 3) requirements. CAR is closed				

CAR ID	04	**Section no.**	D.6	**Date:** 07/11/2019
Description of CAR				
The value considered parameter $\mathbf{EF_{grid,y}}$ is not correct the CPA-DD. • In section B.4.2, the value of 0.9610 tCO_2/MWh is considered. But this not consistent with the combined margin calculated as per CEA CO_2 Baseline Database, Version 14. • In section B.5.1, the value considered 0.84 tCO_2/MWh for the Southern Grid or 0.91 tCO_2/MWh is based on CEA CO_2 Baseline Database, Version 7, which is not the latest version.				
Project participant response				**Date:** 12/11/2019
The value in section B.4.2, of 0.9610 tCO_2/MWh has been removed in response to CL01. *The value in section B.5.1. was indeed an old value. This section has been corrected.*				
Documentation provided by project participant				
See the CPA-DD for CPA01, dated 7 October, sections B.4.2, and B.5.1 *ER calculation sheets titled: CER calculations CPA-1 v07 07-10-2019 (Public)*				
DOE assessment				**Date:** 13/04/2020
The emission factor is corrected to 0.8868 tCO2/MWh. This is estimated based on the Build and operating margin provided in CEA CO_2 Baseline Database, Version 14. The build and operating margin in CEA CO_2 Baseline Database, Version 14 is estimated based on the tool to calculate emission factor of an electricity system, version 7. The calculation is checked and found to be appropriate for the 2nd crediting period. However the CEA database version 15 is released now. PP is requested to update the same in the CPA-DD and ER calculation sheet. CAR is open.				
Project participant response				**Date:** 14/04/2020
The emission factor of Indian grid is now calculated based on the CEA database, version 15. The CPA-DD and ER sheet is updated based on the emission factor estimated as per CEA database, v15.				
Documentation provided by project participant				
See the CPA-DD for CPA01, dated 7 October, sections B.4.2, and B.5.1 *ER calculation sheets titled: CER calculations CPA-1 v07 (Public)*				
DOE assessment				**Date:** 15/04/2020
The emission factor is corrected to 0.9029 tCO2/MWh. This is estimated based on the Build and operating margin provided in CEA CO_2 Baseline Database, Version 15. The build and operating margin in CEA CO_2 Baseline Database, Version 15 is estimated based on the tool to calculate emission factor of an electricity system, version 7. The calculation is checked and found to be appropriate for the 2nd crediting period. CAR is closed.				

CAR ID	05	**Section no.**	D.6	**Date:** 07/11/2019
Description of CAR				
1. The emission reduction estimation sheet for the CPA-1 is not provided for verification. 2. The project emission estimation is not provided in the CPA-DD				
Project participant response				**Date:** 12/11/2019
1. The emission reduction estimation sheet *is submitted.* *2. The project emission estimation is now provided in the CPA-DD*				
Documentation provided by project participant				
CPA-DD for CPA01, dated 7 October. *ER calculation sheets titled: CER calculations CPA-1 v07 07-10-2019 (Public)*				
DOE assessment				**Date:** 15/11/2019
1. The ER estimation sheet is now provided for verification 2. The details of the project emission is now included in the revised CPA-DD CAR is closed.				

CAR ID	06	**Section no.**	D.8	**Date:** 07/11/2019
Description of CAR				
The crediting period start date mentioned in the CPA-DD is not correct. In Section E.3.2, the start date of the crediting period is mentioned as 01/02/2013 which is not valid for the 2nd crediting period.				
Project participant response				**Date:** 12/11/2019
That is indeed an omission. The start date of the crediting period has been revised to 01/02/2020				
Documentation provided by project participant				
See the corrected CPA-DD for CPA01, dated 7 October.				

DOE assessment	Date: 15/11/2019
The start date of crediting period is now corrected to *01/02/2020.* *CAR is closed.*	

CAR ID	07	Section no.	D.5	Date: 15/11/2019
Description of CL				
All the eligibility criteria included in the revised PoA-DD (submitted for RCP) are not justified in the section F of CPA-DD.				
Project participant response				**Date:** 09/01/2020
All the eligibility criteria of PoA-DD is justified in the revised CPA-DD				
Documentation provided by project participant				
Revised CPA-DD				
DOE assessment				**Date:** 25/01/2020
Now all the eligibility criteria have been justified in the section F of the CPA-DD. CAR is closed				

CAR ID	08	Section no.	D.6	Date: 15/11/2019
Description of CL				
• Stepwise approach for calculating grid emission factor is not provided in the CPA-DD. • As per the emission factor calculation sheet, the simple OM is calculated based on the weighted average of last three year OM. This is not in line with the para 42 of Tool to calculate emission factor of an electricity system, version 7. As per the tool, para 42, the weighted average OM is applicable for the ex-ante option. Since the project is applying ex-post option, this is not applicable.				
Project participant response				**Date:** 09/01/2020
- *The step-wise approach to calculating grid emission factor is provided in CPA-DD* - *The calculation based on ex-post approach is applied based on data of the latest available CEA values. The OM is based on data available for the latest year and the BM is fixed for the second crediting period based on the latest Methodological TOOL 07, Version 7 and CEA Data for India.*				
Documentation provided by project participant				
- *Revised Grid Emission Factor Calculations, ER Calculations Sheet and Revised CPA-DD-01*				
DOE assessment				**Date:** 25/01/2020
• Stepwise approach for calculating grid emission factor is provided in the CPA-DD. • The simple OM estimation is now estimated based on the ex-post approach. The OM is based on data available for the latest year and the BM is fixed for the second crediting period based on the latest Methodological TOOL 07, Version 7 and CEA Data CAR is closed.				

Table 3. FAR from this validation

~~FAR ID~~	~~xx~~	~~Section no.~~		~~Date: DD/MM/YYYY~~
~~Description of FAR~~				
~~NA~~				
~~CME response~~				~~Date: DD/MM/YYYY~~
~~Documentation provided by CME~~				
~~DOE assessment~~				~~Date: DD/MM/YYYY~~

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Document information

Version	*Date*	*Description*
03.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM validation and verification standard for programmes of activities" (CDM-EB93-A08-STAN); • Make editorial improvements.
02.0	29 December 2017	Revision to align with the requirements of the "CDM validation and verification standard for programme of activities" (version 01.0). Change form symbol from CDM-CPA-RCP-FORM to CDM-CPA-RCPV-FORM.
01.0	3 August 2015	Initial publication.

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