




**Verification and certification report form for
CDM programme of activities
(Version 04.0)**

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 PoA reference number: 8855		
Version number(s) of the PoA-DD(s) to which this report applies	Version: 11; Dated: 12/02/2020		
Version number of the verification and certification report	03		
Completion date of the verification and certification report	16/07/2021		
Monitoring period number and duration of this monitoring period	Seventh Monitoring Period 01/02/2020 - 31/12/2020 (including both the days)		
Number and version number of the monitoring report to which this report applies	Monitoring report number 1, Version 04 (Dated: 15/07/2021)		
Coordinating/managing entity (CME)	Nuetech Solar Systems Pvt. Ltd.		
Host Parties	Host Parties of the PoA	Is this a host Party to a CPA covered in this report? (yes/no)	
	India	Yes	
Applied methodologies and standardized baselines	AMS-I.C- Thermal energy production with or without electricity, Version 21.		
Mandatory sectoral scopes	1: Energy industries (renewable - / non-renewable sources)		
Conditional sectoral scopes, if applicable	Not applicable		
Estimated amount of GHG emission reductions or GHG removals for this monitoring period in the included CPAs covered in this report	30,504 tCO ₂ e		
Certified amount of GHG emission reductions or GHG removals for this monitoring period for the included CPAs covered in this report	Amount before 1 January 2013	Amount from 1 January 2013 until 31 December 2020	Amount from 1 January 2021
	--	18,264 tCO ₂ e	--
Name and UNFCCC reference number of the DOE	E-0052: Carbon Check (India) Private Ltd.		
Name, position and signature of the approver of the verification and certification report	Vikash Kumar Singh, Compliance Officer 		

SECTION A. Executive summary

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Purpose, general description and location of the project activity:

Nuetech Solar Systems Pvt. Ltd., the coordinating and managing entity of the PoA (hereafter referred as CME) has commissioned the DOE, Carbon Check (India) Private Ltd. to perform an independent Seventh (7th) verification of the CDM Programme of Activity (PoA) titled “Solar Water Heater Programme in India” (UNFCCC Ref. No.: 8855) for CPA titled: “Solar Water Heater Program in India- “CPA-1” (8855-P2-0001-CP2).

The PoA involves installation of Solar Water Heaters in residential and commercial buildings in India. The solar water heaters utilise renewable solar thermal energy to produce hot water for various applications. The solar water heaters save the amount of fossil fuel fired electricity consumed by electric geysers. The programme therefore leads to reduction of GHGs.

This report summarises the findings of the verification of the project, performed on the basis of §62 of the CDM M & P, as well as criteria given to provide for consistent project operations, monitoring and reporting and the subsequent decisions by the CDM Executive Board. Verification is required for all registered CDM project activities/programme of activities intending to confirm their achieved emission reductions and proceed with request for issuance of CERs. This report contains the findings and resolutions from the verification and a certification statement for the certified emission reductions.

Objective:

Verification is the periodic independent review and ex-post determination of both quantitative and qualitative information by a Designated Operational Entity (DOE) of the monitored reductions in GHG emissions that have occurred as a result of the registered CDM PoA during a defined monitoring period.

Certification is the written assurance by a DOE that, during a specific period in time, a PoA achieved the emission reductions as verified.

The objective of this verification is to verify and certify emission reductions reported for the Programme of activities “Solar Water Heater Programme in India” for the period 01/02/2020 to 31/12/2020 (including both the days).

The purpose of verification is to review the monitoring results and verify that the monitoring methodology was implemented according to the monitoring plan and monitoring data and used to confirm the reductions in anthropogenic emissions by sources, is sufficient, definitive and presented in a concise and transparent manner.

In particular, the monitoring plan, monitoring report and the compliance of CPAs with relevant UNFCCC and host Party criteria are verified in order to confirm that the CPAs have been implemented in accordance with the previously registered/included CPA-DD and conservative assumptions, as documented. It is also confirmed if the monitoring plan is in accordance with the registered PoA-DD/CPA-DD /B04/ and the approved monitoring methodology.

Scope:

The scope of the verification is:

- To verify the project implementation and operation with respect to the registered PoA-DD /B04/
- To verify the implemented monitoring plan with the registered PoA-DD /B04/ and applied baseline and monitoring methodology /B02/
- To verify that the actual monitoring systems and procedures are in accordance with the monitoring systems and procedures described in the monitoring plan.

- To evaluate the GHG emission reduction data and express a conclusion with a reasonable level of assurance about whether the reported GHG emission reduction data is free from material misstatement; and
- To verify that reported GHG emission data is sufficiently supported by evidence.

The verification shall ensure that the reported emission reductions are complete and accurate in order to be certified.

Verification process:

The verification comprises a review of the monitoring report /01/ over the monitoring period from 01/02/2020 to 31/12/2020 and based on the registered PoA-DD/CPA-DD /B04/ in part of the monitoring parameters and monitoring plan, emission reduction calculation spreadsheet /03/, monitoring methodology and all related evidence provided by the CME.

Remote interviews and stakeholders' interviews are also performed as part of the verification process.

Conclusion:

The verification team assigned by the DOE concludes that the registered PoA-DD (Version 11, dated: 12/02/2020) /B04/, included CPA-DD (Version 11, dated: 14/04/2020) /B04/ and the Monitoring report (version 04, dated: 15/07/2021) /02/, meets all relevant requirements of the UNFCCC for CDM project activities/ programme of activities including article 12 of the Kyoto Protocol and §62 of CDM M& P, the modalities and procedures for CDM (Marrakesh Accords) and the subsequent decisions by the COP/MOP and CDM Executive Board. The verification has been conducted in-line with the requirements of CDM VVS for PoA (version 02.0) /B01-1/.

One (01) Forward Action Requests (FARs) from previous verification, five (05) Clarification Requests (CLs) and three (03) Corrective Action Requests (CARs) were raised during verification. All the raised FAR, CARs and CLs have been resolved by the CME.

The PoA was correctly implemented according to selected monitoring methodology, monitoring plan and the registered PoA-DD /B04/. The monitoring system was installed, maintained in a proper manner, while collected monitoring data allowed for the verification of the amount of achieved GHG emission reductions. Through the review and remote interviews, the verification team confirms that the project activity has resulted in the 18,264 tCO₂e emission reductions during the seventh monitoring period.

CC IPL as a DOE is able to issue a positive verification opinion expressed in the attached Certification statement.

SECTION B. Verification team, technical reviewer and approver**B.1. Verification team members**

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	Interview(s)	Verification findings
1.	Team Leader/Technical Expert/Local Expert	IR	Anand	Amit	CC IPL	X	-	X	X
2.	Trainee Assessor	IR	Gedam	Pallavi Ganesh	CC IPL	X	-	X	X

B.2. Technical reviewer and approver of the verification and certification report

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	Agarwalla	Sanjay Kumar	CC IPL
2.	Approver	IR	Singh	Vikash Kumar	CC IPL

SECTION C. Application of materiality in conducting the verification**C.1. Consideration of materiality in planning the verification**

No.	Risk that could lead to material errors, omissions or misstatements	Assessment of the risk		Response to the risk in the verification plan and/or sampling plan
		Risk level	Justification	
1.	Human Error: Recording and reporting of the information in the ER spreadsheet.	Medium	All the ER spreadsheet data of the SWHs, including sales database, including data calculation. This includes all the parameters to be monitored ex-post as per the registered PoA-DD / CPA-DDs /B04/.	The risk was mitigated by the training of the personnel involved in the data capture, calculation and by following the monitoring responsibilities. The training records were reviewed which was also confirmed during the on-site visit interviews. Verification team, based on the above, confirms that the risk is appropriately mitigated.
2.	Information System: Use of spreadsheets without adequate controls related to data changes/updates, version tracking, traceability, security	Medium	The data is recorded in the spreadsheets based on the information entered into various customised software such as Manufacturing Plus and Customer Support Manager (CSM). The access to the spreadsheets for calculation of ERs, monitoring and sales	The identified risk was mitigated by managing access to the records. It was confirmed through interviews that initial information is collected by the dealers/surveyors and then transmitted and stored electronically to the PP's office. The data quality control is maintained by the Technical

			database and Stove efficiency testing records.	& Quality Control department.
3.	Sample	Medium	Sample size is not suitable; or the surveyed SWHs at the CPA level are not random	Cross-check the procedure to identify the sample size against the sampling guideline and standard and confirm the sample size is calculated correctly. CC IPL conducted a random sample following the sampling standard during on site visit. Based on the result of acceptance sampling, the monitoring records are deemed acceptable.

C.2. Consideration of materiality in conducting the verification

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The threshold of materiality was evaluated based on §13 of “Guideline: Application of materiality in verifications” Version 02.0 /B08/ and § 308 of CDM VVS for PoAs, version 02.0 /B01-1/. It was concluded that the materiality threshold applicable to the project activity based on actual emission reductions achieved is 5% of 18,264 tCO₂e which is equal to 913 tCO₂e.

In planning the verification, verification team took cognizance of §11 and 12 of the “Guideline: Application of materiality in verifications” Version 02.0 /B08/. A materiality threshold of 913 tCO₂e is determined in line with §308 (d) of CDM VVS for PoAs, version 02.0 /B01-1/.

The verification has been performed through a desk review and remote interviews with relevant personnel. The verification activities in which risks were assessed are the evaluations of:

- Monitoring system including SWHs surveys.
- Calculation spreadsheets.
- Quality of raw data and procedures for its collection.
- Data flow.
- Data control procedures.

The risks identified were mitigated through the review of whole databases /05/ and calculation spreadsheets and cross-check against monitoring survey records /06/.

In conducting the verification, DOE took cognizance of §13-17 of the “Guideline: Application of materiality in verifications” (version 02.0) /B08/ and based on the input of data from different sources checked through sampling of records during off-site. Some mistakes were identified and subsequently corrected. These findings are detailed in Appendix 4, and they were successfully closed. Therefore, related identified mistakes as listed in findings in Appendix 4 to this report have been determined to be immaterial. All identified inconsistencies and clarification requests have been successfully closed.

Based on the assessment carried out, CC IPL confirms with a reasonable level of assurance that the claimed emission reductions are free from material errors, omissions or misstatements.

SECTION D. Means of verification**D.1. Desk/document review**

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The verification was performed primarily based on the review of the Monitoring report /1/ /2/ and the supporting documentation. This process included review of data and information presented to verify their completeness and review of the monitoring plan and monitoring methodologies /B02/. Documents reviewed or referenced during the verification are listed in Appendix 3 below.

D.2. On-site inspection

In the view of current situations where travel restrictions have been put in place for domestic as well as international travel around the world due to COVID-19 pandemic, the DOE has decided to conduct the verification remotely (without on-site inspection) for CPA (8855-P2-0001-CP2) for this MP (01/02/2020 to 31/12/2020) in accordance with the communication from the UNFCCC secretariat for the COVID-19 pandemic (relaxation on the mandatory site visits)¹.

The on-site inspection can-not be postponed due to verification timeline agreed between the CME and the DOE as per the verification contract.

The alternative means used for the purpose of verification are demonstrated as follow:

The verification team has carried out remote interviews (telephonically as well as via google meet) to assess the information included in the monitoring report and monitoring measurement procedures adopted during the monitoring period on 14/05/2021. During the desk review, the relevant monitoring records were checked. Previous periodic monitoring reports and verification reports and soft copy of original survey records were used to cross check consistency of information.

Through the review of validation reports, previous verification reports, comparing the relevant evidence and interview with the CME's representatives through telephone / skype, remote interviews with the house holds sampled by the DOE from the CME's samples, CCIPL has confirmed that the project is implemented in line with the registered PoA-DD/CPA-DD during the monitoring period. There is no change of the project design, operation and monitoring plan.

Remote interviews were performed by verification team in order to assess the following:

Duration of on-site inspection: 14/05/2021				
No.	Activity performed on-site	Site location	Date	Team member
1.	An assessment of the implementation and operation of the registered project activity as per the registered PoA-DD, CPA-DD.	Remote Audit (via telephone & google meet)	14/05/2021	Amit Anand and Pallavi Gedam
2.	A review of information flows for generating, aggregating and reporting the monitoring parameters	Remote Audit (via telephone & google meet)	14/05/2021	Amit Anand and Pallavi Gedam
3.	Interviews with relevant personnel to determine whether the operational and data collection procedures are implemented in accordance with the monitoring plan in the registered CPA-DD	Remote Audit (via telephone & google meet)	14/05/2021	Amit Anand and Pallavi Gedam
4.	A cross check between information provided in the monitoring report and data from other sources such as plant logbooks, inventories, purchase records or similar data sources	Remote Audit (via telephone & google meet)	14/05/2021	Amit Anand and Pallavi Gedam
5.	A check of the monitoring equipment including calibration performance and	Remote Audit (via telephone &	14/05/2021	Amit Anand and Pallavi Gedam

¹ https://cdm.unfccc.int/newsroom/latestnews/releases/2020/01041_index.html

	observations of monitoring practices against the requirements of the registered CPA-DD and the selected methodology and corresponding tool(s), where applicable	google meet)		
6.	A review of calculations and assumptions made in determining the GHG data and emission reductions	Remote Audit (via telephone & google meet)	14/05/2021	Amit Anand and Pallavi Gedam
7.	An identification of quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters	Remote Audit (via telephone & google meet)	14/05/2021	Amit Anand and Pallavi Gedam

D.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	T.	Ananth	NSSPL	14/05/2021	Project Implementation, Sales, records Monitoring Survey, QA/QC, operation, monitoring procedure, data and information flow, Database management, Human resource management, identification of training needs Data and information flow, Management and operating system	Amit Anand & Pallavi Gedam
2.	Ramamurthy	Baby	NSSPL	14/05/2021	Data and information flow, Management and operating system Database management, monitoring survey	Amit Anand & Pallavi Gedam
3.	Padmanabha	Sudha	Fair Climate Network (CDM Consultant)	14/05/2021	Project implementation and operation, monitoring procedure, data and information flow, CER calculation and completeness of monitoring report, QA/QC Procedures, Management and operating system	Amit Anand & Pallavi Gedam

D.4. Sampling approach

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The total population size of the Solar Water Heaters (SWHs) distributed under the CPA 1 (8855-P2-0001-CP2) covered under monitoring period is 12,472.

The monitoring parameters monitored through the sampling plan are:

- 1) Share of systems confirmed to be operational (S_{OP})
- 2) Number of operational days in year y (D).

Stratified sampling at CPA level was applied by the CME for the selection of the monitoring samples with 90/10 confidence/precision which is deemed acceptable as per the registered PoA-DD and CPA-DD /B04/ and §11 of Standard: Sampling and surveys for CDM project activities and programmes of activities (version 09.0) /B07/. The same is deemed acceptable as per the approved revised PoA-DD and CPA-DD /B04/, which applies Standard for Sampling and Surveys for CDM project activities and programmes of activities (Version 07.0) /B12/.

The sampling was conducted for Category I systems (systems with capacity less than 45kWth). The Category I systems are further divided in two strata i.e., systems located in regions with relatively high radiation (strata I) and systems located in regions with lower radiation (strata II). The total number of SWHs sampled for estimation of the number of operational days is 70. Out of the total 70 SWHs; 50 SWHs were sampled from high radiation region (Strata I) and 20 from low radiation region (Strata II). Verification team reviewed the sampling size and the strata as selected for the survey and the details as available from the survey records /06/ and confirms that the sampling has been done in accordance with the requirements of sampling standard /B07/, registered PoA-DD and CPA-DD /B04/ and the applied methodology, AMS-I.C (version 21.0) /B02/.

As per §25 of the Standard: Sampling and surveys for CDM project activities and programmes of activities (version 09.0) /B07/, the verification team has to verify whether the project participants or the coordinating/managing entity have implemented the sampling and surveys according to the sampling plan in the registered monitoring plan. The verification includes determining:

- (a) Whether the required confidence/precision has been met
- (b) Whether the selected sample was representative of the population.

In line with §26 of the Sampling Standard (version 09.0) /B07/, the verification team has applied a sampling approach for remote surveys as part of verification. Now as the CME had applied sampling approach, the verification team has chosen acceptance sampling for parameters number of operational systems and the number of operation days of the system in a year (D) in accordance with §28 of the sampling standard (version 09.0) /B07/.

The following table illustrates the agenda covered during the acceptance sampling by the DOE in accordance with Table 1, § 37 of “Standard: Sampling and surveys for CDM project activities and programmes of activities (version 09.0) /B07/:

Parameter	How the CME conducted sampling surveys (to obtain the project participant's or the coordinating/managing entities' records)	How the DOE could obtain records for verification	Criteria for deciding what ultimately constitutes a discrepancy
D (Number of operational days in year y)	Sampling based survey (questionnaire survey/interviews)	Cross-check of a sample of project participants' samples (questionnaire, operation surveys/interviews) including but not limited to following: <ul style="list-style-type: none"> Consistency between the information as contained in Survey 	DOE results, accounting for duly justified differences.

		<p>sheet and revealed from the on-site inspection interviews</p> <ul style="list-style-type: none"> • Baseline scenario of the household • Enquire/observe whether SWH system is in use or not? • Enquire about the days of operation/annual hours of operation of SWHs during the project scenario. • Enquire/observe parallel use of any other type of water heaters? 	
<p>S_{OP} (Share of systems confirmed to be operational)</p>	<p>Sampling based survey (questionnaire survey/interviews)</p>	<p>Cross-check of a sample of project participants' samples (questionnaire, operation surveys/interviews) including but not limited to following:</p> <ul style="list-style-type: none"> • Consistency between the information as contained in Survey sheet and revealed from the on-site inspection interviews • Baseline scenario of the household • Enquire/observe whether SWH system is in use or not? • Enquire/observe parallel use of any other type of water heaters? 	<p>DOE results, accounting for duly justified differences.</p>

The verification team of the DOE has applied a sampling approach as part of verification in accordance with the §26 of the Standard: Sampling and surveys for CDM project activities and programmes of activities (version 09.0) /B07/. In accordance with the §28 of the sampling standard, acceptance sampling has been chosen by the verification team and accordingly steps listed in §29 of the sampling standard have been followed. The verification team has opted for AQL of 0.5 % and UQL of 20 %; producer risk and consumer risk of 10 % each in determining the DOE's sample size. Accordingly, a sample size of 11 households per strata (high radiation region and low radiation region) i.e., in total 22 samples from the 1 CPAs from the PP/CME's sample size for the PoA for the monitoring period with acceptance number (c) as 0.

Accordingly, the verification team verified a total of 17 samples i.e., 11 Samples from high radiation region (strata I) and 6² samples from low radiation region (strata II) and observed that the sampling survey results of the CME for all the households checked were found to be consistent with DOE's remote survey results. Thus, no discrepant records were observed with the published MR /01/ /02/ and ER sheet /03/ /04/ and thus c=0. Hence, CME's set of records has been accepted in line with §33 of the sampling standard (version 09.0) /B07/.

The necessary confidence/precision of 90/10 each of the parameters are met. This has been cross verified by the verification team.

D.5. Clarification requests, corrective action requests and forward action requests raised

Areas of verification findings	No. of CL	No. of CAR	No. of FAR
General			
Compliance of the monitoring report with the monitoring report form	-	-	-
Remaining forward action requests from validation and/or previous verifications	-	-	FAR 01
CPAs considered for verification and covered in this report	-	-	-
Programme of activities	-	-	-
Compliance of the programme implementation with the registered PoA-DD	-	-	-
Implementation and operation of the management system	-	-	-
Post-registration changes	-	-	-
• Corrections	-	-	-
• Inclusion of a monitoring plan	-	-	-
• Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents ³	-	-	-
• Changes to the programme design	-	-	-
• Addition of CPA inclusion template	-	-	-
• Change of coordinating/managing entity	-	-	-
• Changes specific to afforestation and reforestation activities	-	-	-
Component project activities	-	-	-
Compliance of the CPA implementation with the included CPA design document	-	-	-
Post-registration changes	-	-	-
• Temporary deviations from registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents	-	-	-
• Corrections	-	-	-
• Changes to the start date-of the crediting period	-	-	-
• Inclusion of a monitoring plan	-	-	-
• Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents	-	-	-
• Changes to the project design	-	-	-
• Changes specific to afforestation and reforestation	-	-	-

² During the review of monitoring survey, it was observed that in low radiation region (strata II) only six (06) households responded and participated in monitoring survey out of PP's sample size of twenty (20). The fourteen (14) households, which didn't respond were considered non-operational. So, in Low radiation region (strata II) only six (06) households which responded during the monitoring survey were interviewed by the VT in acceptance sampling for assessment of the CME's survey results.

³ 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).

activities			
Compliance of the registered monitoring plan with applied methodologies and standardized baselines	-	-	-
Compliance of monitoring activities with the registered monitoring plan	-	-	-
<ul style="list-style-type: none"> Data and parameters fixed ex ante or at renewal of crediting period 	-	-	-
<ul style="list-style-type: none"> Data and parameters monitored 	CAR 01	-	-
<ul style="list-style-type: none"> Implementation of sampling plan 	CAR 02	CL 01 CL 03 CL 04 CL 05	-
Compliance with the calibration frequency requirements for measuring instruments	-	-	-
Assessment of data and calculation of emission reductions or net removals	-	-	-
<ul style="list-style-type: none"> Calculation of baseline GHG emissions or baseline net GHG removals by sinks 	-	-	-
<ul style="list-style-type: none"> Calculation of project GHG emissions or actual net GHG removals by sinks 	-	-	-
<ul style="list-style-type: none"> Calculation of leakage GHG emissions 	-	-	-
<ul style="list-style-type: none"> Summary of calculation of GHG emission reductions or net GHG removals by sinks 	-	-	-
<ul style="list-style-type: none"> Comparison of actual GHG emission reductions or net GHG removals by sinks with estimates in included CPA 	-	-	-
<ul style="list-style-type: none"> Remarks on difference from estimated value in included CPA 	-	-	-
Assessment of reported sustainable development co-benefits	-	-	-
Global stakeholder consultation	-	-	-
Others (Editorial)	CAR 03	-	-
Others (Supporting documents)	-	CL 02	-
Total	03	05	01

SECTION E. Verification findings

E.1. General

E.1.1. Compliance of the monitoring report with the monitoring report form

Means of verification	Document review, Interviews
Findings	--
Conclusion	<p>CME has used the Monitoring report form for CDM programme of activities (version 04.0) /B03/. Verification team confirms that the latest available version of the Monitoring report template /B03/ has been used by the CME and the MR complies with the monitoring report form and instructions therein /B03/.</p> <p>CC IPL, had made the monitoring report (version 01, dated 08/04/2021) /1/, covering the monitoring period from 01/02/2020 to 31/12/2020 (both days inclusive) publicly available on 22/04/2021.</p> <p>This confirms compliance with the §338 and §339 of CDM VVS for PoAs, (version 02.0) /B01-1/.</p>

E.1.2. Remaining forward action requests from validation and/or previous verifications

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There was one (FAR 01) forward action requests from the previous sixth verification. The FAR has been satisfactorily resolved. Please refer Appendix 4 of this report.

E.1.3. CPAs considered for verification and covered in this report

Title and UNFCCC reference number of the CPA included in the PoA as of the end of this monitoring period	Is the CPA considered for this verification? (Yes/No)	The date when the CPA was included	Version of the PoA-DD	Confirmation that a request for issuance including the CPA has been published for the previous monitoring period (Y/N)
Solar Water Heater Program in India- "CPA-1" (8855-P2- 0001-CP2)	Yes	29/04/2020	Version 11.0; Dated: 12/02/2020	Y

E.2. Programme of activities

E.2.1. Compliance of the programme implementation with the registered programme design document

Means of verification	Document review, Interviews
Findings	--
Conclusion	<p>CC IPL by means of remote interviews and document review, assessed that all physical features (technology, project equipment, and monitoring) of the CPA in the PoA is in place and that the CME (Nuotech Solar Systems Pvt. Ltd.) has operated the PoA and the CPA as per registered PoA-DD /B04/ and included CPA-DD /B04/. The CPA-1 (8855-P2-0001-CP2) has been implemented by Nuotech Solar Systems Pvt. Ltd. i.e., the CME itself.</p> <p>The PoA involves installation of Solar Water Heaters (SWHs) in residential as well as commercial buildings throughout India. The SWHs are sold directly to the customers or through dealers/distributors /05/. The overall responsibility of implementation and operation is with CME (Nuotech Solar Systems Pvt. Ltd. (referred to as NSSPL)) as per the approved revised PoA-DD /B04/, which was also evident through review of PoA/CPA database. This monitoring period includes monitoring of CPA-1 (8855-P2-0001-CP2) as part of the PoA.</p> <p>CPA-1 (8855-P2-0001-CP2) being verified during this monitoring period, as referenced above in section E.1.3 of this report, has been implemented within the geographical boundary of India as described in the approved revised PoA-DD /B04/ and constitutes the physical boundary as well.</p> <p>CPA-1 (8855-P2- 0001-CP2) include SWHs which use thermal energy of the sun to produce hot water /B04/. The SWH mainly consists of a solar energy collector (either solar panel or evacuated tubes) and an insulated tank; the former traps the solar energy to heat water and later stores the hot water for usage. The CPA involves installation of 2 types and 2 categories of system, their details are as:</p> <ol style="list-style-type: none"> 1. Type of SWHs: <ol style="list-style-type: none"> a. Flat Plate Collector (FPC) b. Evacuated Tube Collector (ETC) 2. Category: <ol style="list-style-type: none"> a. Cat I system: systems with installed thermal capacity less than 45kW_{th}. For these systems the annual energy production is determined based on the number of days of operation. b. Cat II system: systems with installed thermal capacity of more than 45kW_{th}. For these systems the energy production will be metered through flow metering and metering the temperature of the water leaving the SWH system using BTU meters⁴.

⁴ None of the Cat II systems are being considered under this monitoring period for estimation of emission reductions

	<p>The category I (cat I) systems are further divided into two strata based on the amount of solar radiation received per day (kWh/m²/day) in the region where they are installed. The two strata are defined based on the NREL Global Horizontal Solar Resource map from 16/08/2010 (available at the MNRE website: https://mnre.gov.in/india-solar-resource-maps). Thus, the two identified strata are:</p> <ol style="list-style-type: none"> 1. High radiation region/states (typically receive solar radiation in the range of 5.5-6.0 kWh/m²/day) 2. Low radiation region/states (roughly receive solar radiation in the range of 4.5-5.5 kWh/m²/day) <p>The total population size of the Solar Water Heaters (SWHs) distributed under the CPA-1 (8855-P2- 0001-CP2) and covered under monitoring period is 12,472.</p> <p>All the SWHs implemented under the CPA are either Flat Plate Collectors (FPCs) or Evacuated Tube Collectors (ETCs) and are manufactured by NSSPL. The technical details of the SWHs were verified by the manufacturer specifications and was found to be consistent with the approved revised PoA-DD / CPA-DD /B04/.</p> <p>The verification team has confirmed that the number of SWHs deployed under each CPA is under the limit as set by the CME during the inclusion of each CPA and thus CPA remains under the threshold of 45 MW_{th} as defined in the applied methodology AMS I.C (version 21.0) /B02/ and each unit is maintained under a capping of 640m² to maintain an individual capacity of 1% of the SSC threshold.</p> <p>There are no deviations or proposed or actual changes in the implementation or operation of the PoA and the included CPAs.</p> <p>The verification took cognizance of §253 of the CDM PS for PoA (version 02.0) /B01- 2/ and §340 (a) and §341 of CDM VVS for PoA (version 02.0) /B01-1/.</p>
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E.2.2. Implementation and operation of the management system

Means of verification	Document review, Interviews
Findings	-
Conclusion	<p>The PoA management system including the record-keeping system has been explained in the approved revised PoA-DD /B04/. During verification, the verification team, based on review of provided documents and remote interview/observation, has assessed the management system. This included the organisational structure, roles and responsibilities, data collection, transfer and aggregation procedures, training of personnel, data storage and archiving and emergency procedures for the monitoring system.</p> <p>Based on remote interviews with the personnel of NSSPL involved in the project monitoring and data collection, inspection of monitoring database and document review, CCIPL can confirm that the responsibilities and authorities for monitoring and reporting are appropriate and effective for the project type and hence in accordance with the monitoring plan of the approved revised PoA-DD and the CPA-DD /B04/ and the applied monitoring methodology /B02/.</p> <p>The verification team confirms that the monitoring management system of the CDM PoA is in place; with the responsibilities properly identified and in place. This confirms the compliance of §340 (a) and §347 (b) (iv) of CDM VVS for PoA (version 02.0) /B01-1/.</p>

E.2.3. Post-registration changes

E.2.3.1. Corrections

>>

Not Applicable for this crediting period.

E.2.3.2. Inclusion of a monitoring plan

>>

Not Applicable for this crediting period.

E.2.3.3. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

>>

Not Applicable for this crediting period.

E.2.3.4. Changes to the programme design

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Not Applicable for this crediting period.

E.2.3.5. Addition of CPA inclusion template

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Not Applicable for this crediting period.

E.2.3.6. Change of coordination/managing entity

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Not Applicable for this crediting period.

E.2.3.7. Changes specific to afforestation and reforestation activities

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Not Applicable for this crediting period.

E.3. Component project activities**E.3.1. Compliance of the CPA implementation with the included CPA design document**

Means of verification	Document review, Interviews																																		
Findings	--																																		
Conclusion	<p>Carbon Check's verification team considers the CPA description of the project contained in the registered CPA-DD /B04/ to be complete and accurate. The CPA have been implemented in accordance with the registered PoA-DD/CPA-DD /B04/.</p> <p>The implementation status of CPA-1 (8855-P2-0001-CP2) claiming emission reduction during this monitoring period is as:</p> <table border="1"> <thead> <tr> <th>CPA Ref. No.</th><th>8855-P2-0001-CP2</th></tr> </thead> <tbody> <tr> <td>CPA Implementer</td><td>NSSPL</td></tr> <tr> <td>Location</td><td>India</td></tr> <tr> <td>Scale</td><td>Small</td></tr> <tr> <td>Inclusion Date</td><td>29/04/2020</td></tr> <tr> <td>Crediting Period Type</td><td>Renewable</td></tr> <tr> <td>Crediting period duration</td><td>01/02/2020 to 31/01/2027</td></tr> <tr> <td>Monitoring period number</td><td>07 (1st for second crediting period)</td></tr> <tr> <td>Monitoring period duration</td><td>01/02/2020 to 31/12/2020</td></tr> <tr> <td>No. of SWHs as per CPA-DD</td><td>12,472</td></tr> <tr> <td>No. of SWHs installed during current MP</td><td>12,472</td></tr> <tr> <td>Of which Cat II systems⁵ installed</td><td>1</td></tr> <tr> <td>Max. Surface area to be installed for each CPA (SSC Limit) (m²)</td><td>64,000</td></tr> <tr> <td>Total surface area installed (m²)</td><td>59,412</td></tr> <tr> <td>Max. Thermal capacity to be installed for each CPA (SSC Limit) (MW_{th})</td><td>45</td></tr> <tr> <td>Total thermal capacity installed (MW_{th})</td><td>41.59</td></tr> <tr> <td>Ex-ante estimated ERs (tCO₂)</td><td>33,236</td></tr> </tbody> </table>	CPA Ref. No.	8855-P2-0001-CP2	CPA Implementer	NSSPL	Location	India	Scale	Small	Inclusion Date	29/04/2020	Crediting Period Type	Renewable	Crediting period duration	01/02/2020 to 31/01/2027	Monitoring period number	07 (1 st for second crediting period)	Monitoring period duration	01/02/2020 to 31/12/2020	No. of SWHs as per CPA-DD	12,472	No. of SWHs installed during current MP	12,472	Of which Cat II systems ⁵ installed	1	Max. Surface area to be installed for each CPA (SSC Limit) (m ²)	64,000	Total surface area installed (m ²)	59,412	Max. Thermal capacity to be installed for each CPA (SSC Limit) (MW _{th})	45	Total thermal capacity installed (MW _{th})	41.59	Ex-ante estimated ERs (tCO ₂)	33,236
CPA Ref. No.	8855-P2-0001-CP2																																		
CPA Implementer	NSSPL																																		
Location	India																																		
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Ex-ante estimated ERs (tCO ₂)	33,236																																		

⁵ None of the Cat II systems are being considered under this monitoring period for estimation of emission reductions.

Per unit ERs (ex-ante) (tCO₂/unit)	2.66
No. of SWHs installed during previous MP	12,472
Actual ERs achieved during previous monitoring period (tCO₂)	21,965
Per unit ERs achieved during previous monitoring period (tCO₂/unit)	1.76
Actual ERs achieved during the current monitoring period (tCO₂)	18,264
Per unit ERs (actual) achieved during the current monitoring period (tCO₂/unit)	1.46

The CPA includes SWHs which use thermal energy of the sun to produce hot water /B04/. The SWH mainly consists of a solar energy collector (either solar panel or evacuated tubes) and an insulated tank; the former traps the solar energy to heat water and later stores the hot water for usage. All the SWHs implemented under the CPA-1 (8855-P2-0001-CP2) are either Flat Plate Collectors (FPCs) or Evacuated Tube Collectors (ETCs) and are manufactured by NSSPL. The technical details of the SWHs were verified by the manufacturer specifications and was found to be consistent with the registered PoA-DD / CPA-DD /B04/.

The verification team has confirmed that the number of SWHs deployed under this CPA remains under the SSC threshold of 45 MW_{th} as defined in the applied methodology AMS I.C (version 21.0) /B02/ and each unit is maintained under a capping of 640 m² to maintain an individual capacity of 1% of the SSC threshold.

The CPA under the PoA involves the distribution of SWHs in the host country India. The exact location of SWHs could be verified from the monitored distribution database /05/ and sample sales receipts /13/ for each SWHs under the implemented CPA.

The component project activity was implemented, and equipment installed as described in the registered CPA-DD /B04/.

The SWH sales/distribution agreement between CME and end-user has a provision, which gives exclusive rights /14/ of the CERs to CME and the recipient households provide their consent to transfer all the ERs generated through the use of SWHs to the CME/CPA implementor (NSSPL) by signing the customer authorization form /14/. Operation of the devices is confirmed through interview with the end-users/households during the remote audit undertaken by the verification team. Followings were verified during remote audit:

1. Unique identification system for the SWHs
2. Electronic monitoring system including input procedure
3. Actual Sales and implementation of the SWHs
4. Household-representatives were interviewed regarding the operational status and no. of days of operation of SWHs
5. Process of data collection during sales and implementation of SWHs
6. Agreements/registration between households and the CME

It was confirmed during the remote interviews and review of registered CPA-DD /B04/ that NSSPL is the Coordinating/Managing Entity for the PoA and is also the CPA implementer for CPA-1 (8855-P2-0001-CP2). The actual component project activity is in line with the registered CPA-DD /B04/.

The information (including data and variables) provided in the MR /2/ is in line with the details provided in the registered CPA-DD/B04/.

The reported monitoring report is a consecutive batch to be reported after the sixth monitoring period /B09/ and is after the end date of the sixth monitoring period for CPA -1 (8855-P2-0001-CP2) i.e., 31/01/2020.

CCIPL's verification team considers the description of the CPA contained in the registered CPA-DD /B04/ to be complete and accurate. The CPA-DD /B04/

	<p>complies with the relevant methodology, tools, forms and guidance at the time of registration/inclusion of CPA-DD.</p> <p>Verification team has assessed the project to check any proposed or actual changes to the project design in accordance with §269 of CDM VVS for PoA (version 02.0) /B01-1/. In the opinion of CCIPL, there is no change to the project design. CCIPL's verification team confirms that the CPA is implemented within the boundary of the PoA as described in the registered PoA-DD /B04/ and the implementation and operation of the project activity has been conducted in accordance with the description contained in the registered PoA-DD and CPA-DD /B04/.</p> <p>In summary, the monitoring period is reasonable, and the operation of the CPA is in accordance with the registered CPA-DD /B04/. The verification team took cognizance of §253 to §256 of CDM PS for PoA (version 02.0) /B01-2/ and §320 b (i), §340, §341 of CDM VVS for PoA (version 02.0) /B01-1/.</p>
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E.3.2. Post-registration changes

E.3.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents

>>

Not Applicable for this crediting period.

E.3.2.2. Corrections

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Not Applicable for this crediting period.

E.3.2.3. Changes to the start-date of the crediting period

>>

Not Applicable for this crediting period.

E.3.2.4. Inclusion of a monitoring plan

>>

Not Applicable for this crediting period.

E.3.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

>>

Not Applicable for this crediting period.

E.3.2.6. Changes to the project design

>>

Not Applicable for this crediting period.

E.3.2.7. Changes specific to afforestation and reforestation activities

>>

Not Applicable for this crediting period.

E.3.3. Compliance of the registered monitoring plan with applied methodologies and standardized baselines

Means of verification	Document review, Interviews
Findings	--
Conclusion	The monitoring plan as contained in registered CPA-DD /B04/ were reviewed against the monitoring requirements of the applied methodology AMS-I.C (version 21.0) /B02/ as well as registered PoA-DD /B04/. Based on this review the VT

	<p>concludes that the monitoring plan contained in the registered CPA-DD /B04/ includes all the parameters which are required to be monitored in the context of the CPA design and description and allows proper determination of emission reductions in accordance with registered PoA-DD /B04/ and applied methodology AMS-I.C (version 21.0) /B02/.</p> <p>The monitoring plan is in accordance with the approved methodology, AMS-I.C (version 21.0) /B02/, that is included in registered CPA-DD /B04/.</p> <p>The verification took cognizance of §343 to §345 of CDM VVS for PoA (version 02.0) /B01-1/.</p>
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E.3.4. Compliance of monitoring activities with the registered monitoring plan

The monitoring has been carried out in accordance with the monitoring plan contained in the registered CPA-DD. This conclusion has been made based on assessment below in section E.3.4.1, E.3.4.2 and E.3.4.3 below.

E.3.4.1. Data and parameters fixed ex ante or at renewal of crediting period

Means of verification	Document review, Interviews				
Findings	--				
Conclusion	The following parameters have been fixed ex-ante for CPA-1 considered under this monitoring period:				
	Parameter	Description of the parameter	Value	Source	Assessment by VT
	V_{catl,n} (m ³ /day)	Aggregated amount of water heated daily in each CPA by Category I system. Category I systems are SWH with less than 64 m ² installed surface.	FPC: 2,113 ETC: 1,074	Sales register of Nuetech Solar Systems Pvt. Ltd.	The value is consistent with registered CPA-DD /B04/ and fixed ex-ante for the duration of the crediting period.
	Build Margin Emission Factor (tCO ₂ /MWh)	Build Margin for Second Crediting Period	0.8811	CO ₂ Baseline Database for the Indian Power Sector by Central Electricity Authority, Ministry of Power, Government of India (User Guide Version 15.0)	The value is consistent with registered CPA-DD /B04/ and fixed ex-ante for the duration of the crediting period.
	η_{EWH} (%)	Efficiency of an electric water heater system	100	§43 Methodology of AMS-I.C (version 21.0) /B02/.	The value is consistent with registered CPA-DD /B04/ and fixed ex-ante for the

					duration of the crediting period.
	Q_n (kWh/day/100l)	Average amount of energy collected by the SWH during a Thermal Performance Test at day-time under standard conditions for 100l water	FPC: 4.6 ETC: 3.17	FPC: Test Report, (RTC file no 729) /16/ Regional Test Centre (Solar Thermal) of the Madurai Kamaraj University, dated 18/07/2011. ETC: Test Report, (RTC file no 730) /15/ Regional Test Centre (Solar Thermal) of the Madurai Kamaraj University, dated 18/07/2011.	The value is consistent with registered CPA-DD /B04/ and fixed ex-ante for the duration of the crediting period.
	TDL_y (%)	Average technical transmission and distribution losses for providing electricity to the category II system	20	Tool to calculate baseline, project and/or leakage emissions from electricity consumption (Version 03) page14.	The value is a default factor as per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (Version 03) /B11/, has been considered in accordance with the applied methodology /B02/. The value is consistent with registered CPA-DD /B04/ and fixed ex-ante for the duration of the crediting period.
Verification team confirms that the Data and parameters fixed ex-ante are in					

	<p>accordance with the registered PoA-DD and registered/ included CPA-DD /B04/ and the monitoring plan.</p> <p>The verification took cognizance of §346 of CDM VVS for PoA (version 02.0) /B01-1/.</p>
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E.3.4.2. Data and parameters monitored

Means of verification	Document Review, Interview
Findings	CAR 01 was raised in this regard and has been satisfactorily closed. Please refer to Appendix 4 of this report for further details.
Conclusion	<p>The Verification team is able to confirm that the data and parameters monitored are in accordance with the registered CPA-DD /B04/ and the monitoring plan /B04/. A complete assessment of each of the monitored parameters has been provided in Appendix 5 of the verification report.</p> <p>The verification took cognizance of §262, 263 and 264 of the CDM PS for PoA (version 02.0) /B01-2/ § 346, § 347(c), §358, §359 and 360 of CDM VVS for PoAs, Version 02.0 /B01-1/.</p>

E.3.4.3. Implementation of sampling plan

Means of verification	Document Review, Interview
Findings	CAR 02 and CL 01, 03, 04 and 05 were raised in this regard and successfully resolved. Please refer to Appendix 4 of this report for further details.
Conclusion	<p>The sampling plan implemented by the CME is in accordance with the applied approved monitoring methodology /B02/ and the registered PoA-DD and CPA-DD /B04/. The CME has appropriately applied Stratified Sampling procedure for determination of parameters in line with the applied methodology /B02/ and registered PoA-DD and CPA-DD /B04/:</p> <ol style="list-style-type: none"> 1. Share of systems confirmed to be operational (S_{OP}) 2. Number of operational days in year y (D). <p>Stratified sampling at CPA level was applied by the CME for the selection of the monitoring samples with 90/10 confidence/precision which is deemed acceptable as per the registered PoA-DD and CPA-DDs /B04/ and also in line with requirements of §11 of Sampling Standard (version 09.0) /B07/. The same is acceptable to the verification team.</p> <p>The total population size of the Solar Water Heaters (SWHs) distributed under the CPA 8855-P2-0001-CP2 and covered under monitoring period is 12,472.</p> <p>In line with §26 of the Sampling Standard (version 09.0) /B07/, the verification team has applied a sampling approach for remote surveys as part of verification. Now as the CME had applied sampling approach, the verification team has chosen acceptance sampling for parameters number of operational systems and the number of operation days of the system in a year (D) in accordance with §28 of the sampling standard (version 09.0) /B07/.</p> <p>DOE used sampling during verification for checking the CME's sample to check the parameters number of operational systems and the number of operation days of the system in a year (D). In accordance with §29 (a) of the Sampling Standard /B07/, the verification team took random samples from the CME's samples. A sample size of 22 households i.e., 11 households per strata (systems located in regions with relatively high radiation (strata I) and systems located in regions with lower radiation (strata II)) was chosen (with no discrepant records). A sample size of 11 was required, based on an AQL of 0.5% and UQL of 20%, the producer and consumer risk used was 10% each. Acceptance number (c) thus determined for the samples is zero (0). Accordingly, the verification team verified a total of 17 samples i.e., 11 Samples from high radiation region (strata I) and 6⁶ samples from low</p>

⁶ During the review of monitoring survey, it was observed that in low radiation region (strata II) only six (06) households responded and participated in monitoring survey out of PP's sample size of twenty (20). The fourteen (14) households, which didn't respond were

radiation region (strata II) and observed that the sampling survey results of the CME for all the households checked were found to be consistent with DOE's remote survey results. Thus, no discrepant records were observed with the published MR /1/ /2/ and ER sheet /3/ /4/ and thus $c=0$. Hence, CME's set of records has been accepted in line with § 33 of the sampling standard (version 09.0) /B07/.

For determination of the parameter in question a common interview questionnaire /06/, /07/ was prepared and was used during the survey by the CME. Verification team has cross verified these sample documents during the remote audit.

The sampling survey has been carried out by the trained people in NSSPL which was also confirmed during the remote audit and through review of training records /11/.

Assessment of sampling for CPA 1:

Stratified sampling at CPA level was applied by the CME for the selection of the monitoring samples with 90/10 confidence/precision which is deemed acceptable as per the registered PoA-DD and CPA-DDs /B04/, which applies Standard for Sampling and Surveys for CDM project activities and programmes of activities (Version 07.0) /B12/.

The sampling was conducted for Category I systems (systems with capacity less than 45kWth). The Category I systems are further divided in two strata i.e., systems located in regions with relatively high radiation (strata I) and systems located in regions with lower radiation (strata II).

PP has calculated the sample size for determination of parameter the number of operation days of the system in a year (D) using "Sample Size Calculator" excel sheet (version 04.0, Annex 6 EB 67). The initial sample size calculated for parameter "Annual hours of operation of an average system (D)" is 3 across both strata and is proportionally allocated as 2 for strata I (high radiation) and 1 for strata II (low radiation) respectively /08/. The verification team confirms the correctness of the sample size calculation which is in accordance with the registered PoA-DD and CPA-DD /B04/.

Applying a response rate of 75.48% the total adjusted sample size comes out to be 4 and after allocating it proportionally it comes out to be 4 for strata I (high radiation) and 1 for strata II (low radiation). As the parameter of interest is mean for monitoring parameter, "Annual hours of operation of an average system (D)", a student's t-distribution test has been performed by PP for the total sample size of 4 and the resulting total sample size comes out as 4 and it is proportionally allocated as calculated 4 for Strata I (high radiation) and 1 for Strata II (low radiation). Furthermore, CME has also applied the student's t-distribution calculation separately for each stratum and the revised sample size calculated for Strata I (high radiation) and Strata II (low radiation) is 4 & 18 respectively. However, the CME has sampled 50 end-users for Strata I (high radiation) and 20 for Strata II (low radiation). The number of end-users sampled by PP for each stratum is more than the required sample size of 4 for strata I (high radiation) and 18 for strata II (low radiation). The same is acceptable to VT.

Moreover, upon review of the student's t-distribution sheet /08/ it was observed that the student t-distribution test has been performed using 90/10 confidence and precision level and the same is in line with the requirements of §11 of Standard: Sampling and surveys for CDM project activities and programmes of activities (version 09.0) /B07/.

The total number of SWHs sampled for estimation of the number of operational days is 70. Out of the total 70 SWHs; 50 SWHs were sampled from high radiation

considered non-operational. So, in Low radiation region (strata II) only six (06) households which responded during the monitoring survey were interviewed by the VT in acceptance sampling for assessment of the CME's survey results.

	<p>region (Strata I) and 20 from low radiation region (Strata II). Verification team reviewed the sampling size and the strata as selected for the survey and the details as available from the survey records /06/ and confirms that the sampling has been done in accordance with the requirements of sampling standard /B07/ and the applied methodology, AMS-I.C (version 21.0) /B02/.</p> <p>The overall actual reliability achieved for number of days of operation is 3.29% and for proportion of systems operational is 1.10% which are within the 10% level. Hence it is deemed that the samples selected are representative of the population.</p> <p>The necessary confidence / precision of 90/10 for the parameter in question (for sampling at CPA level) is met. This has been cross verified by the verification team from the supporting documents submitted /08/, /09/.</p> <p>Verification team confirms that the sampling approach applied by the CME is in accordance with the registered PoA-DD and the CPA-DDs /B04/ including the Guidelines: Sampling and surveys for CDM project activities and programmes of activities (version 04.0) /B06/ and Standard: Standard for sampling and surveys for CDM project activities and Programme of Activities (version 09.0) /B07/.</p> <p>The verification took cognizance of §348 of CDM VVS for PoAs (version 02.0) /B01-1/.</p>
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E.3.5. Compliance with the calibration frequency requirements for measuring instruments

Means of verification	Document Review, Interview
Findings	-
Conclusion	<p>The project activity does not involve any equipment for monitoring. The monitoring of only category I systems has been conducted in the current verification (category II is not monitored in the current verification as per the included CPA-DD /B04/). The CME has complied with the approved PRC and the monitoring results in conservative emission reduction estimates.</p> <p>The monitoring is in accordance with the approved and revised PoA-DD and CPA-DD /B04/.</p> <p>The verification took cognizance of §346 and §351 of CDM VVS for PoAs (version 02.0) /B01-1/.</p>

E.3.6. Assessment of data and calculation of emission reductions or net removals

In line with the requirement of §358 and §359 of CDM VVS for PoAs, (version 02.0) /B01-1/, the verification team has reviewed the Monitoring report /02/ and ER spread sheets /04/ to check the arithmetic calculation of the emission reductions. The equation used for the calculation is compared with those provided in the approved CPA-DD and the methodology AMS-I.C (version 21.0) /B02/.

E.3.6.1. Calculation of baseline GHG emissions or baseline net GHG removals by sinks

Means of verification	Document Review, Interview
Findings	--
Conclusion	<p>Emission reductions have been calculated in line to the applied methodology. the following equation have been applied:</p> $ER_y = BE_y - (PE_y + LE_y)$ <p>Where,</p> <p>ER_y = Emission reductions by the project activity during a given year y (tCO₂e/year)</p> <p>BE_y = Baseline emissions of the project activity during the year y (tCO₂e/year)</p> <p>PE_y = Project emissions of the project activity during the year y (tCO₂e/year)</p> <p>LE_y = Leakage emissions in the year y (tCO₂e/year)</p>

Baseline emissions:

The baseline scenario as per the revised and approved PoA-DD /B04/ is electricity utilization for water heating by users, the equation has been used in accordance with the applied methodology:

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

Where,

- $BE_{thermal,CO2,y}$ = The baseline emissions from steam/heat displaced by the project activity during the year y (tCO₂e/year)
- $EG_{thermal,y}$ = The net quantity of steam/heat supplied by the project activity during the year y (GJ/year)
- η_{EWH} = Efficiency of an electric water heater
- $EF_{CO2,grid,y}$ = Grid Emission Factor during the year y (tCO₂e/year)

$EG_{thermal,n,y,cat I}$ has been calculated as follows:

$$EG_{thermal,n,y,cat I} = \frac{V_{catI,n} \times Q_n \times D}{100}$$

Where,

- $EG_{thermal,n,y,cat I}$ = The net quantity of steam/heat supplied by the project activity from Category I systems during the year y (MWh/yr)
- $V_{catI,n}$ = Amount of water heated daily in the CPA by Category I system n (m³/day)
- Q_n = Average amount of energy collected by the SWH during a Thermal Performance Test at day-time under standard conditions for 100l water (kWh/day/100l)
- D = Number of operational days in year y (days/year)

From the above equation and the parameter values, emission reductions are calculated as:

CPA Ref. No.	Achieved ERs (tCO ₂ e) /06/
8855-P2-0001-CP2	18,264

The verification team confirms that the calculation of baseline emission and emission reductions is in accordance with the applied methodological equation and the revised and approved CPA-DDs /B04/. Calculations have been checked and confirmed from the ER spread sheet /04/.

The verification took cognizance of §358 of CDM VVS for PoAs, (version 02.0) /B01-1/.

E.3.6.2. Calculation of project GHG emissions or actual net GHG removals by sinks

Means of verification	Document Review, Interview
Findings	-
Conclusion	<p>The PoA is not considering Category II systems for monitoring as per the registered PoA-DD and CPA-DD /B04/, hence the project emissions from these systems have been disregarded. The approach was found acceptable to the assessment team since the baseline emissions caused prior to the system installation would be higher than the emissions due to the system.</p> <p>Hence, no project emission has been calculated.</p>

E.3.6.3. Calculation of leakage GHG emissions

Means of verification	Document Review, Interview
Findings	-
Conclusion	<p>The registered PoA-DD, CPA-DD /B04/ and applied monitoring methodology /B02/ does not prescribe any leakage emissions to be considered. The remote audit and project design also did not reveal any potential source to be considered in this regard.</p> <p>No leakage emissions were required to be calculated as per the registered PoA-DD and CPA-DD /B04/.</p>

E.3.6.4. Summary of calculation of GHG emission reductions or net GHG removals by sinks

Means of verification	Document Review, Interview
Findings	-
Conclusion	<p>The verification team confirms that all parameters are used correctly in the calculations, all results are verifiable and transparent, all assumptions are described and based on verifiable evidence and calculations are done in accordance with the pre-defined formulae from registered PoA-DD and CPA-DD /B04/. The total number of ERs achieved during the monitoring period is 18,264 tCO₂e.</p> <p>In summary, verification team confirms that actual emission reduction is lower than the estimate of the ERs provided in the registered CPA-DD /B04/ for the current monitoring period.</p> <p>The verification took cognizance of §358 of CDM VVS PoA (version 02.0) /B01-1/.</p>

Title and UNFCCC reference number of the CPA	Baseline emissions or baseline net GHG removals by sinks (tCO ₂ e)	Project emissions or actual net GHG removals by sinks (tCO ₂ e)	Leakage (tCO ₂ e)	GHG emission reductions or net GHG removals by sinks (tCO ₂ e)		
				Amount achieved before 1 January 2013	Amount achieved from 1 January 2013	Amount achieved in the entire monitoring period
Solar Water Heater Program in India- "CPA-1" (8855-P2-0001-CP2)	18,264	0	0	0	18,264	18,264
Total	18,264	0	0	0	18,264	18,264

E.3.6.5. Comparison of actual GHG emission reductions or net GHG removals by sinks with estimates in included CPA

Means of verification	Document Review
Findings	-
Conclusion	<p>Comparison of the actual GHG emission reductions with the estimates in the included specific CPAs is given in the below table.</p> <p>The verification team took cognizance of §358 of CDM VVS for PoAs (version 02.0) /B01-1/.</p>

Title and UNFCCC reference number of the CPA	Actual values achieved by the CPAs during this monitoring period	Value estimated in ex ante calculation in the included CPA-DD(s)
Solar Water Heater Program in India- "CPA-1" (8855-P2-0001-CP2)	18,264	30,504
Total	18,264	30,504

E.3.6.6. Remarks on difference from estimated value in included CPA

Means of verification	Document review
Findings	-
Conclusion	Verification team confirms that actual emission reduction is lower than the estimate of the registered CPA-DD /B04/ for the current monitoring period.

E.3.7. Assessment of reported sustainable development co-benefits

Means of verification	Not applicable (as there are no sustainable development co-benefits required as per the registered CPA-DD)
Findings	-
Conclusion	Not applicable (as there are no sustainable development co-benefits required as per the revised and approved CDM PoA-DD and CPA-DD /B04/.) The verification took cognizance of § 361 of CDM VVS PoAs (version 02.0) /B01-1/.

E.3.8. Global stakeholder consultation

Means of verification	Not applicable (as this is not first Monitoring report)
Findings	-
Conclusion	Not applicable (this is not first Monitoring report) The verification took cognizance of § 370 of CDM VVS PoAs (version 02.0) /B01-1/.

SECTION F. Internal quality control

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The final verification report passed a technical review before being submitted to the UNFCCC Executive Board. A technical reviewer qualified in accordance with the CC IPL's qualification scheme for CDM validation and verification has performed the technical review.

SECTION G. Verification opinion

>>

Carbon Check (India) Private Ltd. has performed the seventh (07th) periodic verification of the registered CDM Programme of Activities "Solar Water Heater Program in India" (UNFCCC Ref. No.: 8855) for the CPA Solar Water Heater Program in India- "CPA-1" (8855-P2-0002-CP2):

The verification team assigned by the DOE concludes that the Component Project Activities as described in the table above and the Monitoring report (version 04, dated 15/07/2021), meet all relevant requirements of the UNFCCC for CDM project activities including article 12 of the Kyoto Protocol and §62 of CDM M & P, the modalities and procedures for CDM (Marrakesh Accords) and the subsequent decisions by the COP/MOP and CDM Executive Board. The verification has been conducted in-line with the requirements of CDM VVS for PoA (version 02.0) /B01-1/.

Verification methodology and process:

The Verification team confirms the contractual relationship signed on 12/04/2021 between the DOE, (Carbon Check (India) Private Ltd.) and the Co-ordinating Managing Entity (Nuotech Solar Systems Pvt. Ltd.). The team assigned to the verification meets the Carbon Check (India) Private

Ltd.'s internal procedures including the UNFCCC requirements for the team composition and competence.

The verification team has conducted a thorough contract review as per UNFCCC and Carbon Check's procedures and requirements.

The verification is being performed as per the requirements described in the CDM VVS for programme of activities (version 02.0) /B01-1/ and constitutes the review and completion of the following steps:

- Reviewing the registered PoA-DD (Version 11, dated: 12/02/2020) /B04/, registered CPA-DD for CPA-1 (8855-P2-0001-CP2) (Version 11, dated: 14/04/2020) /B04/ including the monitoring plan and the corresponding validation report/s;
- Previous verification and certification reports and the monitoring reports for Monitoring Period 1, Monitoring Period 2, Monitoring Period 3, Monitoring Period 4, Monitoring Period 5 and Monitoring Period 6 /B09/
- Publication of the MR on the UNFCCC website (version 01, dated: 08/04/2021) on 22/04/2021
- Desk review of the validation report, MR and other relevant documents including documents related to the CPAs in emission reductions
- Review of the applied monitoring methodology (AMS-I.C, version 21.0) /B02/
- Review of any CMP and EB decisions, clarifications and guidance
- Remote interviews/audit (14/05/2021)
- Resolution of one outstanding FAR from previous verification
- Resolution of CARs and CLs raised during verification
- Issuance of Verification Report

The component project activities were correctly implemented according to the selected monitoring methodology /B02/, monitoring plan and the registered CPA-DD /B04/. The monitoring system was installed, maintained in a proper manner, while collected monitoring data allowed for the verification of the amount of achieved GHG emission reductions. Through the review and remote interviews, the verification team confirms that the PoA has resulted in the 18,264 tCO₂e emission reductions during the seventh (07th) monitoring period.

CPA Ref. No.	Achieved ERs (tCO ₂ e) /06/
8855-P2-0001-CP2	18,264
Total	18,264

The break-up of emission reduction up to 31/12/2012, from 01/01/2013 until 31/12/2020 and from 01/01/2021 onwards as verified during the course of verification are as below:

Item	Emission reductions up to 31 December 2012	Emission reductions from 1 January 2013 onwards until 31/12/2020	From 1 January 2021 onwards
Emission reductions (tCO ₂ e)	0	18,264	0

CIPL as a DOE is therefore pleased to issue a positive verification opinion expressed in the attached Certification statement.

SECTION H. Certification statement

Carbon Check (India) Private Limited (the “DOE”), has performed the seventh (07th) periodic verification of the CPA titled “Solar Water Heater Program in India- “CPA-1” (8855-P2-0001-CP2)” in the registered Programme of Activities titled, “Solar Water heater program in India” (UNFCCC ref. No.: 8855) for the monitoring period 01/02/2020 to 31/12/2020. The PoA involves installation of Solar Water Heaters in residential and commercial buildings in India. The solar water heaters utilise renewable solar thermal energy to produce hot water for various applications. The solar water heaters save the amount of fossil fuel fired electricity consumed by electric geysers. The programme therefore leads to reduction of GHGs.

The CME who is also the CPA implementer is responsible for the collection of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the CPAs. It is DOE’s responsibility to express an independent verification statement on the reported GHG emission reductions from the component projects. The DOE does not express any opinion on the selected baseline scenario or on the registered PoA-DD and CPA-DDs /B04/. The verification is carried out in-line with the requirements of CDM VVS for PoAs (version 02.0) /B01-1/.

The verification is performed to identify the compliance of the component projects with the implementation and monitoring requirements, and to verify the actual amount of achieved emission reductions, through obtaining evidence and information on-site that includes:

- i) Checking whether the provisions of the monitoring methodology and the monitoring plan were consistently and appropriately applied; and
- ii) The collection of evidence supporting the reported data.

The verification is based on:

- Review of registered PoA-DD (version 11, dated: 12/02/2020) /B04/
- Review of registered CPA-DD (version 11, dated: 14/04/2020) and its monitoring plan /B04/;
- Review of previous verification and certification reports and the monitoring reports for Monitoring Period 1, 2, 3, 4, 5 and 6 /B09/;
- Review of approved monitoring methodology AMS-I.C “Thermal energy production with or without electricity (Version 21.0) /B02/.
- Review of validation report /B04/ for the registered PoA-DD and CPA-DDs.
- Review of monitoring report(s) for monitoring period 7: Version 01 (dated 08/04/2021) /01/; version 02 (dated 15/06/2021) /01/, version 03 (dated 30/06/2021) and version 04 (dated 15/07/2021) /02/

This statement covers verification period from 01/02/2020 to 31/12/2020 (including both the days).

The DOE had raised five (05) clarifications (CLs), three (03) corrective action request (CARs) and one (01) Forward action required (FAR) from previous verification all of which have been satisfactorily resolved by the CME to provide a positive opinion on this verification by the DOE.

The DOE, hereby certifies that the project activity, achieved emission reductions by sources of GHG equal to 18,264 tCO₂e and all monitoring requirements have been fulfilled and is substantiated by an audit trail that contains evidence and records.

The break-up of emission reduction up to 31/12/2012, from 01/01/2013 until 31/12/2020 and from 01/01/2021 onwards as verified during the course of verification are as below:

Item	Emission reductions up to 31 December 2012	Emission reductions from 1 January 2013 onwards until 31/12/2020	From 1 January 2021 onwards
Emission reductions (tCO ₂ e)	0	18,264	0

Appendix 1. Abbreviations

Abbreviations	Full texts
AQL	Acceptable Quality Limit
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CAR	Corrective Action Request
CC IPL	Carbon Check (India) Private Ltd.
CER	Certified Emission Reduction
CL	Clarification Request
CME	Co-ordinating and Managing entity
CPA	Component Project Activity
CPA-DD	Component Project Activity Design Document
CO ₂	Carbon Dioxide
CO ₂ e	Carbon Dioxide Equivalent
DR	Document review
DOE	Designated Operational Entities
DVR	Draft Verification Report
EB	CDM Executive Board
EF	Emission Factor
EI	External individual
ETC	Evacuated Tube Collector
FA	Final Approval
FAR	Forward Action Request
FPC	Flat Plate Collector
FVR	Final verification Report
GHG	Greenhouse gas(es)
GEF	Grid Emission Factor
HHs	Households
I	Interview
IPCC	Intergovernmental Panel on Climate Change
IR	Internal resource
MP	Monitoring Period
MWh	Mega Watt Hour
MR	Monitoring Report
NSSPL	Neutech Solar Systems Pvt. Ltd.
PoA	Programme of Activities
PoA-DD	Programme of Activities Design Document
PP	Project Participant
QC/QA	Quality control /Quality assurance
RMP	Revised Monitoring Plan
SWH	Solar Water Heaters
TA	Technical Area
TR	Technical Review
UNFCCC	United Nations Framework Convention on Climate Change
UQL	Unacceptable Quality Limit
VVS	Validation and Verification Standard

Appendix 2. Competence of team members and technical reviewers



Carbon Check (India) Private Ltd.

Amit Anand

has been qualified as per CCIPL's internal qualification procedures, in accordance with requirements of Accreditation Standard (version 07.0):

For following functions:

Validator	<input checked="" type="checkbox"/>	Team Leader	<input checked="" type="checkbox"/>	Technical reviewer	<input checked="" type="checkbox"/>
Verifier	<input checked="" type="checkbox"/>	Technical Expert	<input checked="" type="checkbox"/>	Local Assessor ¹	<input checked="" type="checkbox"/>

In the following Technical Areas:

TA 1.1	<input checked="" type="checkbox"/>	TA 3.1	<input checked="" type="checkbox"/>	TA 5.2	<input type="checkbox"/>	TA 9.2	<input type="checkbox"/>	TA 13.2	<input type="checkbox"/>
TA 1.2	<input checked="" type="checkbox"/>	TA 4.1	<input type="checkbox"/>	TA 8.1	<input checked="" type="checkbox"/>	TA 10.1	<input type="checkbox"/>	TA 14.1	<input checked="" type="checkbox"/>
TA 2.1	<input type="checkbox"/>	TA 5.1	<input type="checkbox"/>	TA 9.1	<input type="checkbox"/>	TA 13.1	<input checked="" type="checkbox"/>		

Mr. Vikash Kumar Singh
Compliance Officer

Date of Approval
24/12/2020

Valid Till
24/12/2021

Revision History of the Document

26/12/2014	Initial Adoption
24/12/2015	Annual Revision
20/01/2016	Interim Revision for office address change
23/12/2017	Annual Revision
24/12/2017	Annual Revision
24/12/2018	Annual Revision
24/12/2019	Annual Revision
01/03/2020	Interim Revision for office address change
01/09/2020	Interim Revision for CCIPL logo change
24/12/2020	Annual Revision

¹ India and South Africa

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Corporate off: Unit No. 1701, Logix City Centre Office Tower, Plot No. BW-58, Sector-32 Noida, Uttar Pradesh
Tel: +91 120 4373114 | URL: www.carboncheck.co.in | e-mail: info@carboncheck.co.in



Carbon Check (India) Private Ltd.

Sanjay Agarwalla

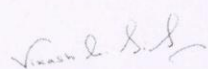
has been qualified as per CCIPL's internal qualification procedures, in accordance with requirements of Accreditation Standard (version 07.0):

For following functions:

Validator ☒ Team Leader ☒ Technical reviewer ☒
 Verifier ☒ Technical Expert ☒ Local Assessor¹ ☒

In the following Technical Areas:

TA 1.1 ☒ TA 3.1 ☒ TA 5.2 ☒ TA 9.2 ☒ TA 13.2 ☐
 TA 1.2 ☒ TA 4.1 ☒ TA 8.1 ☐ TA 10.1 ☐ TA 14.1 ☐
 TA 2.1 ☒ TA 5.1 ☒ TA 9.1 ☒ TA 13.1 ☒


 Mr. Vikash Kumar Singh
 Compliance Officer


 Mr. Amit Anand
 CEO

Date of Approval
 24/12/2020

Valid Till
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24/12/2018	Annual Revision
24/12/2019	Annual Revision
01/03/2020	Interim Revision for office address change
01/09/2020	Interim Revision for CCIPL logo change
24/12/2020	Annual Revision

¹ India

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Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
/01/	NSSPL	Webhosted Monitoring report	Version 01 Dated: 08/04/2021	CME
		Interim Monitoring report	Version 02 Dated: 15/06/2021 Version 03 Dated: 30/06/2020	
/02/	NSSPL	Final Monitoring report	Version 04; Dated: 15/07/2020	CME
/03/	NSSPL	Emission reduction calculation spread sheets for the CPA-1 (8855-P2-0002-CP2) corresponding to /01/	CPA1-2021-V1-CP2.xlsx CPA1-2021-V2-CP2.xlsx	CME
/04/	NSSPL	Emission reduction calculation spread sheets for the CPA-1 (8855-P2-0002-CP2) corresponding to /2/	CPA1-2021-CP2-V3.xlsx	CME
/05/	NSSPL	SWHs database records for the CPA-1 (8855-P2-0002-CP2)	--	CME
/06/	NSSPL	Survey records for the monitoring period for both high radiation region (strata I) and low radiation region (strata II): • Forms • Excel Sheet	CPA 1 Survey results-V2.xlsx	CME
/07/	Climate Focus	Monitoring survey questionnaire template	--	CME
/08/	NSSPL	Sample Size calculator / Student's t-distribution sheet	Meth_guid48Calculator-2021-V1-t calculations-revised-CPA1.xlsx	CME
/09/	NSSPL	Operational days and unit calculator	CPA 1 Survey results-V2.xlsx	CME
/10/	Central Electricity Authority, Ministry of Power, Government of India	CO ₂ Baseline Database for the Indian Power Sector (version 16.0)	March 2021	Others
/11/	NSSPL	Training Records	--	CME
/12/	NSSPL	Guarantee Certificates	Ref. No.: 21670	CME
/13/	NSSPL	Sample copy of sales invoice	--	CME
/14/	NSSPL	Sample Customer Authorization: Waiver of CERs right	--	CME
/15/	Madurai Kamaraj University	ETC test Report (RTC file no.: 730)	Dated: 18/07/2011	CME
/16/	Madurai Kamaraj University	FPC Test Report (RTC file no.: 729)	Dated: 18/07/2011	CME
/17/	NSSPL	Random sample generator	--	CME
/18/	Climate Focus	CME Manual: Neutech solar water heater PoA	Version:03 Dated: 12/12/2012	CME
/19/	Natural Capital Partners Americas LLC	Emission reduction purchase agreement	Dated: 11/03/2021	CME
/20/	Central Electricity Authority, Ministry	CO ₂ Baseline Database for the Indian Power Sector (version	December 2019	Others

	of Power, Government of India	15.0)		
/B01/	UNFCCC	1. CDM VVS for PoA 2. CDM PS for PoA 02.0) 3. CDM PCP for PoA 02.0)	Version 02.0	Others
/B02/	UNFCCC	AMS-I.C. Thermal energy production with or without electricity	Version 21.0	Others
/B03/	UNFCCC	Instructions for filling out the monitoring report form for CDM programme of activities	Version 04.0	Others
/B04/	UNFCCC	1. RCP PoA-DD 2. CPA-DD corresponding validation reports.	Version 11, Dated: 12/02/2020 Version 11, Dated:14/04/2020	Others
/B05/	Web sites	Websites: http://cdm.unfccc.int/	==	Others
/B06/	UNFCCC	Guidelines: Sampling and surveys for CDM project activities and programmes of activities	Version 04.0	Others
/B07/	UNFCCC	Standard: Standard for sampling and surveys for CDM project activities and Programme of Activities	Version 09.0	Others
/B08/	UNFCCC	Guideline: Application of materiality in verifications" (version 02.0)	http://cdm.unfccc.int/	Others
/B09/	UNFCCC	Monitoring Reports and Verification Reports of the previous monitoring periods: 1. MR (version: 04; Dated: 27/07/2020) and corresponding VR for MP 6 2. MR (version: 07; Dated: 15/01/2020) and corresponding VR for MP 5 3. MR (version: 02; Dated: 13/07/2018) and corresponding VR for MP4 4. MR (version: 04; Dated: 01/10/2017) and corresponding VR for MP3 5. MR (version: 03.2; Dated: 17/08/2016) and corresponding VR for MP2 6. MR (version: 01; Dated: 17/04/2015) and corresponding VR for MP1	http://cdm.unfccc.int/	Others
/B10/	UNFCCC	Tool to calculate emission factor for an electricity system	Version 07.0	Others
/B11/	UNFCCC	Tool to calculate baseline, project and/or leakage emissions from electricity consumption	Version 03	Others
/B12/	UNFCCC	Standard for Sampling and Surveys for CDM project activities and programmes of activities	Version 07.0	Others

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

Table 1. Remaining FARs from validation and/or previous verification

FAR ID	01	Section No.	E.2.2/E.3.1	Date: 16/07/2020
Description of FAR				
<i>CME shall ensure that the end user details especially name, address and contact number are captured correctly in the CPA database for each SWH and the end-user details are consistent between database, ER sheet and survey forms. The same needs to be checked during next periodic verification.</i>				
CME response				Date: 15/06/2021
<i>The end user details especially the name, address and contact number are captured in the CPA database. This is made consistent between CPA database, survey forms and survey sheets. The ER Sheet is from the Manufacturing Plus (MFG PLUS) sales data, which is further expanded in the CPA database at end user level.</i>				
Documentation provided by the CME				
<i>CPA database, Survey Forms and Excel Sheets of Surveys from previous monitoring period and this monitoring period.</i>				
DOE assessment				Date: 05/07/2021
Based on the review of the revised CPA database the validation team confirms that the CME has updated the database to ensure that end user details especially name, address and contact number are captured correctly in the CPA database for each SWH, and the end-user details are consistent between database, ER sheet and survey forms. complete data such as surname and first name, while entering the end user data.				
FAR is closed.				

Table 2. CLs from this verification

CL ID	01	Section no.	E.3.4.3	Date: 17/05/2021
Description of CL				
<i>CME has applied student t-distribution to calculate the sample size for monitoring parameter "Annual hours of operation of an average system (D)" as the initial sample size calculated for Strata I (high radiation) is 2 and Strata II (low radiation) is 1.</i>				
<i>However, the student t-distribution test has been applied to total sample size of 3 and has not been performed separately for both the strata when the key input values viz., population, expected mean and expected SD for both the strata are different. CME shall explain how the same is in line with the sampling approach provided in the registered CPA-DD.</i>				
CME response				Date: 15/06/2021
<i>The student t-distribution to calculate sample size for monitoring parameter Annual hours of operation of an average system (D) for strata I (high radiation) and Strata II (low radiation) was conducted. Accordingly, the iterated value gives a value of 4 for high radiation. For low radiation strata with a value of 1, the iteration gives an error. Hence increasing it to 2, the iterated value becomes 18. This is included in the revised monitoring report.</i>				
Documentation provided by the CME				
<i>Revised Monitoring Report with the explanations provided above Excel sheet for sample size calculations including iteration calculations at strata level.</i>				
DOE assessment				Date: 05/07/2021
CME has provided the revised sample size calculation sheet (Meth_guid48Calculator-2021-V1-t calculations-revised-CPA2-CPA6.xlsx) in which the student's t-distribution calculation has been performed separately for both the strata i.e., Strata I (high radiation) and Strata II (low radiation).				
Upon applying the student's t-distribution calculation separately the revised sample size calculated for Strata I (high radiation) and Strata II (low radiation) is 4 & 18 respectively, whereas the CME has sampled 50 end-users for Strata I (high radiation) and 20 for Strata II (low radiation). The number of end-users sampled by PP for each stratum is more than the required sample size of 18 for each stratum. The same is acceptable to VT.				
CL is closed.				

CL ID	02	Section no.	Others (Supporting Documents)	Date: 17/05/2021
Description of CL				
<p><i>CME shall provide the following supporting documents to DOE:</i></p> <ol style="list-style-type: none"> <i>1. Sample monitoring survey template form</i> <i>2. CERs waiver agreement</i> 				
CME response				Date: 15/06/2021
<p><i>Please find attached the</i></p> <ol style="list-style-type: none"> <i>1. Sample monitoring survey template form</i> <i>2. CERs waiver agreement for the installations which were included in the survey</i> 				
Documentation provided by the CME				
<p><i>Sample monitoring survey template form</i></p> <p><i>CERs waiver agreement for the installations which were included in the survey</i></p>				
DOE assessment				Date: 05/07/2021
<p>CME has provided the VT with following supporting documents:</p> <ol style="list-style-type: none"> Sample monitoring survey template form, which is included as "Appendix 5" of PoA-DD (Version: 07, Date: 29/08/2016). The same has been checked by VT. CL point is closed. Sample CER waiver agreement, which has been included in the sales invoice as well as Customer Authorization Format (CAF) and the same has been checked by VT. CL point is closed. <p>CL is closed.</p>				

CL ID	03	Section no.	E.3.4.3	Date: 17/05/2021
Description of CL				
<p><i>In section E.3 of MR, CME states "70 samples (50 in high radiation and 20 in low radiation) with representation in Low Radiation and High Radiation were conducted".</i></p> <p><i>Considering the above observation, PP shall explain the following:</i></p> <ol style="list-style-type: none"> <i>1. Assumed response rate</i> <i>2. The basis of selecting 70 households</i> <i>3. Explain if the number of systems to be surveyed/samples in high and low radiation were proportionally allocated as per the equation 28 provided in the section B.5.2 of the registered CPA-DD.</i> 				
CME response				Date: 15/06/2021
<ol style="list-style-type: none"> <i>1. Based on the sampling conducted for previous monitoring period, the response rate is 75.48%.</i> <i>2. Applying a response rate of 75.48%, the sample size is estimated as 4, i.e. rounding off, 4 for high radiation and 1 for low radiation.</i> <i>3. Based on proportional allocation, 4 and 1 have to be sampled for high and low radiation. Oversampling i.e. 50 for high radiation and 20 for low radiation was done as good practice, which is higher than the iterated value.</i> 				
Documentation provided by the CME				
<p><i>Revised Monitoring Report</i></p> <p><i>Revised Sample size calculations sheet</i></p>				
DOE assessment				Date: 05/07/2021
<ol style="list-style-type: none"> The assumed response rate considered for arriving at the final adjusted sample size is 75.48% and the same is based on the results obtained during previous monitoring survey. The same is acceptable to VT. CL point is closed. The initial sample size calculated for parameter "Annual hours of operation of an average system (D)" is 3 across both strata and is proportionally allocated as 2 for strata I (high radiation) and 1 for strata II (low radiation). Applying a response rate of 75.48% the total adjusted sample size comes out to be 4 and after allocating it proportionally it comes out to be 4 for strata I (high radiation) and 1 for strata II (low radiation). As the parameter of interest is mean for monitoring parameter, "Annual hours of operation of an average system (D)", a student's t-distribution test has been performed by PP for the total sample size of 4 and the resulting total sample size comes out as 4 and it is proportionally allocated as calculated 4 for Strata I (high radiation) and 1 for Strata II (low radiation). Furthermore, CME has also applied the student's t-distribution calculation separately for each stratum and the revised sample size calculated for Strata I (high radiation) and Strata II (low radiation) is 4 & 18 respectively. However, the PP has performed oversampling and sampled 50 households in Strata I (high radiation) and 20 households in Strata II (low radiation) i.e., a total of 70 households. The same is acceptable to VT as the footnote 11 of the sampling standard (v09.0) encourages oversampling. CL point is closed. The CME has provided the revised sample size calculation sheet (Meth_guid48Calculator-2021-V1-t calculations-V2.xlsx) and through the review of the same it has been confirmed that the number of systems to be surveyed/samples in high and low radiation were proportionally allocated as per the 				

equation 28 provided in the section B.5.2 of the registered CPA-DD. The same is acceptable to VT. CL point is closed.

CL is closed.

CL ID	04	Section no.	E.3.4.3	Date: 17/05/2021
Description of CL				
<i>The description provided in section E.3 of MR, doesn't clearly provide any information to the reader on the following:</i>				
<ol style="list-style-type: none"> 1. <i>Calculates sample size (for each stratum)</i> 2. <i>Adjusted sample size (for each stratum) after student's t-distribution</i> 3. <i>No. of households /end-users surveyed to meet the sample size</i> 4. <i>Achieved precision level</i> 				
CME response				Date: 15/06/2021
<i>The section E.3. of revised MR provides further information on i) calculation of sample size, ii) adjusted sample size for each stratum after student's t-distribution iii) number of households/end-user iii) number of end-users surveyed to meet the sample size and iv) achieved precision level.</i>				
Documentation provided by the CME				
<i>Revised Monitoring Report</i>				
DOE assessment				Date: 05/07/2021
Section E.3 of the MR has been revised to provide the following information:				
<ol style="list-style-type: none"> 1. Calculated sample size (2 for stratum I (high radiation) and 1 for stratum II (low radiation)). CL point is closed. 2. Adjusted sample size for each stratum after student's t-distribution (4 for stratum I (high radiation) and 18 for stratum II (low radiation)). CL point is closed. 3. No. of households /end-users surveyed to meet the sample size (50 for stratum I (high radiation) and 20 for stratum II (low radiation)). CL point is closed. 4. Achieved precision level: <ol style="list-style-type: none"> a. For Annual hours of operation of an average system (D): 3.29% (acceptable as well within the required precision level of 10%). CL point is closed. b. For proportion of systems operational: 1.10% ((acceptable as well within the required precision level of 10%). CL point is closed. 				
CL is closed.				

CL ID	05	Section no.	E.3.4.3	Date: 17/05/2021
Description of CL				
<i>From the review of sample size calculation spreadsheet, it has been observed that the sample size has been calculates by applying 95/10 confidence/precision level.</i>				
<i>CME shall explain how the same is in line with the provisions under paragraph 11 of the Standard: Sampling and surveys for CDM project activities and programmes of activities (Version 09.0) and the approach provided under registered CPA-DD.</i>				
CME response				Date: 15/06/2021
<i>The calculation is revised for confidence/precision level of 90/10. It can be seen that the sample size requirement is still the same.</i>				
Documentation provided by the CME				
<i>Revised Sample size calculations Excel Sheet</i>				
DOE assessment				Date: 05/07/2021
CME has submitted a revised sample size calculation sheet in which applied confidence and precision level has been correctly applied as 90/10. The revision doesn't have an impact on the resulting sample size. The applied confidence and precision level of 90/10 is acceptable as sampling has been performed on annual basis for a single CPA and the same is thus in line with the requirements of 11 of the Standard: Sampling and surveys for CDM project activities and programmes of activities (Version 09.0) and the approach provided under registered CPA-DD.				
CL is closed.				

Table 3. CAR from this verification

CAR ID	01	Section no.	E.3.4.2	Date: 16/01/2020
Description of CAR				

The monitored parameter $EF_{CO_2,grid,n,y}$ is determined through Tool to calculate emission factor for electricity systems (version 06.0).

As per the Tool to calculate emission factor for electricity systems (version 06.0) paragraph 42(b), if the ex-post option is chosen, which is the case for the PoA and CPAs, the emission factor is determined for the year in which the project activity displaces grid electricity, or alternatively the emission factor of the previous year y-1 or y-2 may be used, and the same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

The data for calculation of simple OM gets usually available later than six months after the end of the year. Thus, as per 'Tool to calculate emission factor for electricity systems (version 06.0) paragraph 42(b)', data vintage y-1 is applicable. Since no details are available/documented in the PoA-DD and/or CPA-DDs regarding the chosen data vintage (y or y-1 or y-2), the verifying DOE ensure that PP is using the same data vintage(y-1) throughout all crediting periods.

CME response	Date: 15/06/2021
<i>For calculating simple OM, the data of (y-1) i.e. 2019-20 is considered for the current monitoring period. This is the latest data (Version 16) available from the CEA for Indian Grid.</i>	
Documentation provided by the CME	
<i>Grid emission factor calculation sheet based on Version 16 of CEA database.</i>	
DOE assessment	Date: 05/07/2021
<p>The CEA baseline CO₂ emission database (version 16.0) is the latest data that was released in March 2021. The data required to calculate the emission factor for year y is usually available later than six months after the end of year y. Therefore, The CEA Baseline data of the year y-1 (2019-20) has been used in the section F.1 of the MR to calculate the simple operating margin is in compliance of the input data from para 42(b) of the "Tool to calculate the emission factor of an electricity system", (version 07.0.0).</p> <p>So, as was the case in the previous MP (01/04/2019 – 31/03/2020) where data of the year y-1 (2018-19) was used for estimation of parameter $EF_{CO_2,grid,n,y}$ and similarly for this MP (01/04/2020 – 31/12/2020) the data for year y-1 (2019-20) has been used for estimation of grid emission factor. The same is in line with requirements of paragraph 42 (b) of Tool to calculate emission factor for electricity systems (version 07.0). The same is acceptable to VT.</p> <p>CAR is closed.</p>	

CAR ID	02	Section no.	E.3.4.3	Date: 17/05/2021
Description of CL				
<i>The value provided for population size (g) for both the strata i.e., Strata I (high radiation) and strata II (low radiation) in Table 2 in section E.3 of the MR is incorrect.</i>				
CME response				Date: 15/06/2021
<i>The value for population size for high (Strata I) and low radiation (Strata II) is corrected in the revised Monitoring Report.</i>				
Documentation provided by the CME				
<i>Revised Monitoring Report</i>				
DOE assessment				Date: 05/07/2021
The value provided for population size (g) for both the strata i.e., Strata I (high radiation) and strata II (low radiation) in Table 2 in section E.3 of the MR has been corrected.				
CAR is closed.				

CAR ID	03	Section no.	Others (Editorial)	Date: 17/05/2021
Description of CAR				
<ol style="list-style-type: none"> <i>In various sections in the MR, it is mentioned "1st crediting period" whereas this report is for 2nd crediting period. CME needs to clarify on the same.</i> <i>In emission reduction spreadsheet in cell "A56" monitoring period mentioned is incorrect. CME needs to clarify on the same.</i> 				
CME response				Date: 15/06/2021
<ol style="list-style-type: none"> <i>It is a typographic error. In section E.2. and F.2. the reference to 1st crediting period is corrected as 2nd Crediting Period.</i> <i>This is a typographic error. The cell A56 is corrected to "Monitoring Period (01-02-2020 to 31-12-2020)"</i> 				
Documentation provided by the CME				
<i>Please find attached a revised monitoring report and ER Calculations Sheet with the corrections</i>				

DOE assessment	Date: 05/07/2021
1. The MR has been revised by CME to remove the reference of “1 st crediting period” and reference of “2 nd crediting period” has been correctly provided throughout the MR. CAR point is closed. 2. The monitoring period has been correctly provided in the cell A56 of the revised emission reduction spreadsheet. CAR point is closed.	
CAR is closed.	

Table 4. FARs from this verification

FAR ID	xx	Section No.		Date: DD/MM/YYYY
Description of FAR				
-				
CME response				Date: DD/MM/YYYY
-				
Documentation provided by the CME				
-				
DOE assessment				Date: DD/MM/YYYY
-				

Appendix 5. Data & parameters monitored

Monitoring Parameter Requirement	Assessment/ Observation by the DOE
Data / Parameter: (as in monitoring plan of PDD):	D
Description of parameter	Estimating the annual hours of operation of an average system
Data Unit	Days per year
Reported Value	256 days 6,144 hours/year
Measuring/reading/recording frequency	Annually
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes
Details of monitoring equipment:	No monitoring equipment has been used to determine this parameter. Annual surveys conducted through use of survey forms and questionnaires.
Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	Not applicable since no equipment is used to determine the parameter.
Calibration frequency /interval: Is it monitoring methodology /CDM EB guidance / local or national standards / manufacturers specification	No equipment used hence the calibration requirement not applicable.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	No equipment used hence the calibration requirement not applicable.
Company performing the calibration (internal or external calibration):	No equipment used hence the calibration requirement not applicable.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	No equipment used hence the calibration requirement not applicable.
Is (are) calibration(s) valid for the whole reporting period?	No equipment used hence the calibration requirement not applicable.
If applicable, has the reported data been cross-checked with other available data?	Yes. The information provided in the CPA Database /05/ were verified randomly during the remote audit with the survey forms/records /06/ and through interview of the household representatives.
How were the values in the monitoring report verified?	The values reported in the final MR /02/ (and corresponding ER sheet /04/) were verified from the annual survey /06/. The end users were remotely interviewed to record the days of operation in a year. The uniqueness of the SWH is maintained by tank numbers for ETC and/or collector numbers for FPCs. During the monitoring survey exercise, name of the owner, address of the household, capacity of the system and date of installation are recorded in the survey form. The information from the form /06/ is then translated in the excel for calculation of the operation hours and operational rate. Number of systems implemented before the start of current monitoring period and are transparently indicated in the

	<p>emission reduction calculations. Consequently, the number of SWH sold under each CPA is also consistent with registered CPA-DD /B04/.</p> <p>The parameters have been identified based on the survey conducted for this monitoring period, the calculations were verified, and the source survey forms /06/ were also verified by the assessment team.</p>
Does the data management (from data generation to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	The necessary QA/QC for this parameter is in place. The verification team has cross checked the audit trail of the data management for this parameter (SWH sales data base /05/, Sales agreements /13/, monitoring survey records /06/). Furthermore, the verification team confirmed the competence of the team involved in monitoring and recording during the remote interviews and by reviewing the training documents /11/.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	<p>Not applicable.</p> <p>Full data is available for the monitoring period.</p>

Monitoring Parameter Requirement	Assessment/ Observation by the DOE
Data / Parameter: (as in monitoring plan of PDD):	S_{op}
Description of parameter	Share of systems confirmed to be operational
Data Unit	%
Reported Value	60.42%
Measuring/reading/recording frequency	Annually
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes
Details of monitoring equipment:	No monitoring equipment used to determine this parameter. Annual surveys conducted through use of survey forms and questionnaires.
Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	Not applicable since no equipment is used to determine the parameter.
Calibration frequency /interval: Is it monitoring methodology /CDM EB guidance / local or national standards / manufacturers specification	No equipment used hence the calibration requirement not applicable.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	No equipment used hence the calibration requirement not applicable.
Company performing the calibration (internal or external calibration):	No equipment used hence the calibration requirement not applicable.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	No equipment used hence the calibration requirement not applicable.
Is (are) calibration(s) valid for the whole reporting period?	No equipment used hence the calibration requirement not applicable.
If applicable, has the reported data been cross-checked with other available data?	Yes. The information provided in the CPA Database /05/ were verified randomly during the remote audit with the

	survey forms/records /06/ and through interview of the household representatives.
How were the values in the monitoring report verified?	<p>The values reported in the final MR /02/ (and corresponding ER sheet /04/) were verified from the annual survey /06/. The end users were remotely interviewed to record if the SWH is operating. The uniqueness of the SWH is maintained by tank numbers for ETC and/or collector numbers for FPCs. During the monitoring survey exercise, name of the owner, address of the household, capacity of the system and date of installation are recorded in the survey form. The information from the form /06/ is then translated in the excel for calculation of the operation hours and operational rate.</p> <p>Number of systems implemented before the start of current monitoring period and are transparently indicated in the emission reduction calculations. Consequently, the number of SWH sold under each CPA is also consistent with registered CPA-DD /B04/.</p> <p>The parameters have been identified based on the survey conducted for this monitoring period, the calculations were verified, and the source survey forms /06/ were also verified by the assessment team.</p>
Does the data management (from data generation to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	The necessary QA/QC for this parameter is in place. The verification team has cross checked the audit trail of the data management for this parameter (SWH sales data base /05/, Sales agreements /13/, monitoring survey records /06/). Furthermore, the verification team confirmed the competence of the team involved in monitoring and recording during the remote interviews and by reviewing the training documents /11/.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	<p>Not applicable.</p> <p>Full data is available for the monitoring period.</p>

Monitoring Parameter Requirement	Assessment/ Observation by the DOE
Data / Parameter: (as in monitoring plan of PDD):	<i>EG_{thermal, CAT II,y}</i>
Description of parameter	The aggregated amount of thermal energy generated by SWH category II unit in monitoring years 2020 (MWh)
Data Unit	MWh/year
Measuring/reading/recording frequency	The parameter is not being monitored as per the PRC-8855-001 /B04/ and has not been used for emission reduction calculation.
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	
Details of monitoring equipment:	
Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	
Calibration frequency /interval: Is it monitoring methodology /CDM EB guidance / local or national standards / manufacturers specification	

Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	
Company performing the calibration (internal or external calibration):	
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	
Is (are) calibration(s) valid for the whole reporting period?	
If applicable, has the reported data been cross-checked with other available data?	
How were the values in the monitoring report verified?	
Does the data management (from data generation to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	

Monitoring Parameter Requirement	Assessment/ Observation by the DOE
Data / Parameter: (as in monitoring plan of PDD):	$EC_{PJ,n,y}$
Description of parameter	Quantity of electricity consumed by the Category II system in 2020
Data Unit	MWh/unit/year
Measuring/reading/recording frequency	The parameter is not being monitored as per the PRC-8855-001 /B04/ and has not been used for emission reduction calculation.
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	
Details of monitoring equipment:	
Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	
Calibration frequency /interval: Is it monitoring methodology /CDM EB guidance / local or national standards / manufacturers specification	
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	
Company performing the calibration (internal or external calibration):	
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	

Is (are) calibration(s) valid for the whole reporting period?	
If applicable, has the reported data been cross-checked with other available data?	
How were the values in the monitoring report verified?	
Does the data management (from data generation to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	

Monitoring Parameter Requirement	Assessment/ Observation by the DOE
Data / Parameter: (as in monitoring plan of PDD):	EF _{CO2,grid,n,y}
Description of parameter	The CO ₂ emission factor of the grid to which system n is connected
Data Unit	tCO ₂ /MWh
Reported Value	0.8997
Measuring/reading/recording frequency	Latest emission factor during the submission of monitoring report.
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes
Details of monitoring equipment:	None, the emission factor is calculated using values from the latest 'CO ₂ Baseline Database for the Indian Power Sector User Guide Version 16.0' /10/ applying the 'Tool to calculate emission factor for electricity systems' (Version 07.0.) /B10/.
Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	Not applicable since no equipment is used to determine the parameter.
Calibration frequency /interval: Is it monitoring methodology /CDM EB guidance / local or national standards / manufacturers specification	No equipment used hence the calibration requirement not applicable.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	No equipment used hence the calibration requirement not applicable.
Company performing the calibration (internal or external calibration):	No equipment used hence the calibration requirement not applicable.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	No equipment used hence the calibration requirement not applicable.
Is (are) calibration(s) valid for the whole reporting period?	No equipment used hence the calibration requirement not applicable.
If applicable, has the reported data been cross-checked with other available data?	Yes. The calculation included in the emission factor calculation sheet /10/ were verified by the assessment team

	inline to the steps provided in the tool.
How were the values in the monitoring report verified?	<p>The grid emission factor is calculated in accordance with the "Tool to calculate the emission factor of an electricity system", (version 07.0.0) /B10/ which is the latest version of the tool.</p> <p>The Central Electricity Authority, Ministry of Power, Government of India has published a database of Carbon Dioxide Emission from the power sector in India based on detailed authenticated information obtained from all operating power stations in the country. The Operating Margin and build Margin in the CEA database /10/ is calculated using the guidelines provided by the UNFCCC in the "Tool to calculate the emission factor for an electricity system (version 07.0.0)" /B10/. The validation team confirmed that Version 16.0 of the database /10/ was the latest available version at the time of verification.</p> <p>In consistency with the applied tool /B10/, approved and revised CPA-DDs /B04/ the weights for OM and BM used in PDD for calculating combined margin are 0.25 and 0.75.</p> <p>The value for the emission factor of the Indian electricity grid verified is 0.8997 tCO₂/MWh.</p>
Does the data management (from data generation to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	<p>The CME considered the latest available database and has used the tool appropriately.</p> <p>The emission factor calculation sheet was reviewed and were found reliable.</p>
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	NA. Full data is available for the monitoring period.

Appendix 6. Assessment of Monitoring parameters monitored through sampling/surveys

Sl. No.	Checklist Questions	Assessment									
1.	Does the Monitoring Report apply sampling for determination of ex-post monitoring parameters?	Yes, there are ex-post monitoring parameters determined through the sampling effort.									
2.	Is the applied sampling plan in accordance with the sampling plan proposed in the registered PoA-DD/ PDD?	Yes, the applied sampling plan is in accordance with the sampling plan proposed in the registered PoA-DD /B04/ CPA-DD /B04/.									
3.	<p>List the parameters determined through sampling and respective parameters of interest.</p> <p>[In situations where monitoring is based on data recording once at the time of implementation particularly for distribution projects, where there are large/dispersed number of project technology, the VV team shall make the confirmation to assess its accuracy during the onsite verification through document review and where applicable through acceptance sampling.]</p> <p>[The assessment of implementation status of distribution projects or projects having dispersed and large number of components, it is pertinent that the VV Team shall assess that all physical features (technology, project equipment, and monitoring and metering equipment) of the included CPAs/projects as specified in the included CPA-DDs/PDD in cases where the households/users dropped out or voluntarily leave the project. In this particular case, it is important to assess CME/PP's QA/QC procedures with regards to handling of its database and where applicable consider those dropped out technology as a part of assessment of sampling requirements, including acceptance sampling by DOE.]</p>	<p>Parameters determined through sampling and respective parameters of interest are:</p> <table border="1"> <thead> <tr> <th>Parameter</th><th>Description of Parameter</th><th>Parameter of Interest</th></tr> </thead> <tbody> <tr> <td>D</td><td>Number of operational days in year y</td><td>Mean</td></tr> <tr> <td>S_{OP}</td><td>Share of systems confirmed to be operational</td><td>Proportion</td></tr> </tbody> </table> <p>There are no instances of households/end-users dropping out of technology and no situations where the households/users dropped out or voluntarily leave the project.</p> <p>Furthermore, there are no parameters whose monitoring is based on data recording once at the time of implementation.</p>	Parameter	Description of Parameter	Parameter of Interest	D	Number of operational days in year y	Mean	S _{OP}	Share of systems confirmed to be operational	Proportion
Parameter	Description of Parameter	Parameter of Interest									
D	Number of operational days in year y	Mean									
S _{OP}	Share of systems confirmed to be operational	Proportion									
4.	Is the sample size calculated in accordance with the formula presented in the registered PoA-DD/PDD?	Yes, the sample size calculated is in accordance with the formula presented in the registered PoA-DD/CPA-DD /B04/.									
5.	<p>Are the assumptions used for calculation of sample size appropriate, and correct?</p> <p>P.S.: Provide assessment on appropriateness of value of proportion (p), standard deviation (STDEV) or variance (v) used for calculation of sample size.</p>	<p>Yes, the assumptions used for calculation of sample size is appropriate and correct.</p> <p>The value of standard deviation (STDEV) and mean use for calculation of sample size are taken from the monitoring results of previous MP. The same is in accordance with §13 (c) of the Standard: Sampling and surveys for CDM project activities and programmes of activities (version 09.0) /B07/ and acceptable to VT.</p>									
6.	What are the sample sizes obtained for the parameters being monitored?	The sample size for parameters as mentioned in the table below have been									

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Is the determined sample size deemed adequate for the parameter of interest being monitored?

P.S.: If the sample size calculation returns a value of less than 30 samples, a minimum sample size of 30 shall be chosen when the parameter of interest is a proportion. If the parameter of interest is a numeric mean value (i.e. not a proportion or percentage) the Student's t-distribution shall be used if the resulting sample size is less than 30.

While assessing the sampling effort by the PP/CME particularly the sample size, the VV Team shall make sure the reliability criteria (confidence level and precision) should be as per the requirement of the applied methodology. Only when there is no specific guidance in the applied methodology for the sampling requirements, the confidence/precision as stated in the sampling standards should be considered. As a rule of thumb it is to be always kept in mind that the sampling requirements in the applied methodology shall take precedence.]

calculated using 90/10 confidence and precision level. The same is acceptable as sampling for a single CPA has been conducted and the same is in accordance with the registered PoA-DD and CPA-DD /B04/ and also in accordance with §11 of Standard: Sampling and surveys for CDM project activities and programme of activities (version 09.0).

The number of samples for each of the parameters covered during the monitoring activity is as given below:

CPA 1:

Parameter	Confidence and precision level	Calculated sample size		Samples covered during monitoring	
		High Radiation (Strata I)	Low Radiation (Strata I)	High Radiation (Strata I)	Low Radiation (Strata I)
D (Number of operational days in year y)	90/10	2	1	50	20
S_{OP} (Share of systems confirmed to be operational)					

PP has calculated the sample size for determination of parameter the number of operation days of the system in a year (D) using "Sample Size Calculator" excel sheet (version 04.0, Annex 6 EB 67). The initial sample size calculated for parameter "Annual hours of operation of an average system (D)" is 3 across both strata and is proportionally allocated as 2 for strata I (high radiation) and 1 for strata II (low radiation) respectively /08/. The verification team confirms the correctness of the sample size calculation which is in accordance with the registered PoA-DD and CPA-DDs /B04/.

Applying a response rate of 75.48% the total adjusted sample size comes out to be 4 and after allocating it proportionally it comes out to be 4 for strata I (high radiation) and 1 for strata II (low radiation). As the parameter of interest is mean for monitoring parameter, "Annual hours of operation of an average system (D)", a student's t-distribution test has been performed by PP for the total sample size of 4 and the resulting total sample size comes out as 4 and it is proportionally allocated as calculated 4 for Strata I (high

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		<p>radiation) and 1 for Strata II (low radiation). Furthermore, CME has also applied the student's t-distribution calculation separately for each stratum and the revised sample size calculated for Strata I (high radiation) and Strata II (low radiation) is 4 & 18 respectively. However, the CME has sampled 50 end-users for Strata I (high radiation) and 20 for Strata II (low radiation). The number of end-users sampled by PP for each stratum is more than the required sample size of 4 for strata I (high radiation) and 18 for strata II (low radiation). The same is acceptable to VT.</p> <p>Moreover, upon review of the student's t-distribution sheet /08/ it was observed that the student t-distribution test has been performed using 90/10 confidence and precision level and the same is in line with the requirements of §11 of Standard: Sampling and surveys for CDM project activities and programmes of activities (version 09.0) /B07/.</p>																	
7.	<p>Has reliability specification been applied to determine the sampling requirements for each individual parameter value determined through a sampling effort?</p> <p>P.S.: If there is more than one parameter to be estimated in a CDM project activity, then a sample size calculation should be done for each of them. Then either the largest number for the sample size is chosen for the sampling effort with one common survey, or the sampling effort and survey is repeated for each of the parameters. A random sub-sample within the common survey is allowed as long as: (i) the reliability specification (e.g., 90/10 confidence/precision for small-scale CDM project activities and 95/10 for large scale CDM project activities) is achieved for each individual parameter; and (ii) the random sub-sample is consistent with the design of the survey and the corresponding sample size calculation.</p>	<p>Yes, reliability specification of 90/10 confidence/precision have been applied to determine the sample size for parameters as mentioned in the table below. The same is acceptable as sampling for a single CPA has been applied and the same is in accordance with the registered PoA-DD and CPA-DD /B04/ and also in accordance with §11 of Standard: Sampling and surveys for CDM project activities and programme of activities (version 09.0) /B07/.</p> <p>The number of samples for each of the parameters covered during the monitoring activity is as given below:</p> <p>CPA 1:</p> <table border="1"> <thead> <tr> <th rowspan="2">Parameter</th> <th rowspan="2">Confidence and precision level</th> <th colspan="2">Calculated sample size</th> <th colspan="2">Samples covered during monitoring</th> </tr> <tr> <th>High Radiation (Strata I)</th> <th>Low Radiation (Strata I)</th> <th>High Radiation (Strata I)</th> <th>Low Radiation (Strata I)</th> </tr> </thead> <tbody> <tr> <td>D (Number of operational days in year y)</td> <td rowspan="2">90/10</td> <td rowspan="2">2</td> <td rowspan="2">1</td> <td rowspan="2">50</td> <td rowspan="2">20</td> </tr> <tr> <td>SOP (Share of systems confirmed to be operational)</td> </tr> </tbody> </table>	Parameter	Confidence and precision level	Calculated sample size		Samples covered during monitoring		High Radiation (Strata I)	Low Radiation (Strata I)	High Radiation (Strata I)	Low Radiation (Strata I)	D (Number of operational days in year y)	90/10	2	1	50	20	SOP (Share of systems confirmed to be operational)
Parameter	Confidence and precision level	Calculated sample size			Samples covered during monitoring														
		High Radiation (Strata I)	Low Radiation (Strata I)	High Radiation (Strata I)	Low Radiation (Strata I)														
D (Number of operational days in year y)	90/10	2	1	50	20														
SOP (Share of systems confirmed to be operational)																			

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		<p>PP has calculated the sample size for determination of parameter the number of operation days of the system in a year (D) using "Sample Size Calculator" excel sheet (version 04.0, Annex 6 EB 67). The initial sample size calculated for parameter "Annual hours of operation of an average system (D)" is 3 across both strata and is proportionally allocated as 2 for strata I (high radiation) and 1 for strata II (low radiation) respectively /08/. The verification team confirms the correctness of the sample size calculation which is in accordance with the registered PoA-DD and CPA-DDs /B04/.</p> <p>Applying a response rate of 75.48% the total adjusted sample size comes out to be 4 and after allocating it proportionally it comes out to be 4 for strata I (high radiation) and 1 for strata II (low radiation). As the parameter of interest is mean for monitoring parameter, "Annual hours of operation of an average system (D)", a student's t-distribution test has been performed by PP for the total sample size of 4 and the resulting total sample size comes out as 4 and it is proportionally allocated as calculated 4 for Strata I (high radiation) and 1 for Strata II (low radiation). Furthermore, CME has also applied the student's t-distribution calculation separately for each stratum and the revised sample size calculated for Strata I (high radiation) and Strata II (low radiation) is 4 & 18 respectively. However, the CME has sampled 50 end-users for Strata I (high radiation) and 20 for Strata II (low radiation). The number of end-users sampled by PP for each stratum is more than the required sample size of 4 for strata I (high radiation) and 18 for strata II (low radiation). The same is acceptable to VT.</p> <p>Moreover, upon review of the student's t-distribution sheet /08/ it was observed that the student t-distribution test has been performed using 90/10 confidence and precision level and the same is in line with the requirements of §11 of Standard: Sampling and surveys for CDM project activities and programmes of activities (version 09.0) /B07/.</p>
8.	Is the assumed response rate reasonable (appropriate and correct) for the determination of samples to be surveyed?	<p>The assumed response rates as per MR /02/ and Sample size calculation sheet /08/ are as:</p> <ul style="list-style-type: none"> • CPA 1: 75.48% <p>The response rate is based on the result of the previous monitoring survey conducted by the CME. Hence, the assumed response rate is deemed reasonable (appropriate and correct) for the determination of samples to be surveyed for each of the parameter of interest.</p>
9.	Is the sample selected by PP for determination of the monitored	Yes, the verification team, based on evidence for random number generator

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	parameters unbiased (random) and representative?	/17/ as provided by the CME, confirms that sample selected by the CME for determination of the monitored parameters are random. It can be considered as representative of the population.									
10.	Has minimum target level of precision been achieved based on estimates from the actual samples?	<p>The target level of precision been achieved based on estimates from the actual samples for CPA are as:</p> <p>CPA 1:</p> <table border="1"> <thead> <tr> <th>Parameter</th><th>Target precision level</th><th>Precision achieved</th></tr> </thead> <tbody> <tr> <td>D (Number of operational days in year y)</td><td>10%</td><td>3.29%</td></tr> <tr> <td>S_{OP} (Share of systems confirmed to be operational)</td><td>10%</td><td>1.10%</td></tr> </tbody> </table> <p>Yes, the minimum target level of precision been achieved based on estimates from the actual samples. The same was verified through review of survey records and analysis sheet /06/.</p>	Parameter	Target precision level	Precision achieved	D (Number of operational days in year y)	10%	3.29%	S_{OP} (Share of systems confirmed to be operational)	10%	1.10%
Parameter	Target precision level	Precision achieved									
D (Number of operational days in year y)	10%	3.29%									
S_{OP} (Share of systems confirmed to be operational)	10%	1.10%									
11.	In case the minimum target level of precision has not been achieved based on estimates from the actual samples, please specify the approach adopted by PP to reach the required precision and also justify the appropriateness of the adopted approach in accordance with the applied methodology or paragraph 18 of Sampling and surveys for CDM project activities and programmes of activities (Version 08.0).	Not Applicable.									
12.	<p>Has VT applied acceptance sampling to verify that the results of sampling efforts undertaken by PP for determination of ex-post parameters. If yes, please provide a detailed justification of the approach adopted including information on (but not limited to):</p> <ul style="list-style-type: none"> (a) Selected AQL Level (b) Selected UQL Level (c) Selected Consumer Risk Level (d) Selected Producer Risk Level (e) Sample Size chosen for acceptance sampling (f) Acceptance number (c) <p>Approach adopted by VT to in case value of greater than c discrepant records were observed in the sample</p>	<p>In accordance with the §28 of the sampling standard /B07/, acceptance sampling has been chosen by the verification team and accordingly steps listed in paragraph 29 of the sampling standard /B07/ have been followed.</p> <p>AQL: 0.5% UQL: 20% Consumer risk: 10% Producer risk: 10% Sample Size: 11 Acceptance number (c): 0</p> <p>CPA 1: No discrepant records were observed with the published MR /01/, ER sheet /03/ and monitoring survey questionnaires /06/. Thus, CME's set of records has been accepted in line with §33 of the Standard: Sampling and surveys for CDM project activities and programmes of activities (version 09.0) /B07/.</p>									
13.	Are the procedures for the selected survey and data collection method	Verification team based on remote interviews and review of documented									

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	unambiguously defined and do they adequately provide for minimizing non-sampling errors?	procedure confirms that the selected survey and data collection method is unambiguously defined. This also adequately ensure minimizing non-sampling errors.
14.	Have potential sources of bias inherent in the selected data collection method, such as self-selection and under-coverage, been anticipated? Have mechanisms for mitigating these been considered?	Review of sampling records, documented procedure and remote interviews with the survey team, did not reveal any sources of bias inherent in the selected data collection.
15.	Is the quality control and assurance strategy adequate?	Verification team based on review of provided supporting documents and remote interviews confirms that the quality control and assurance strategy is adequate.
16.	Are the proposed skill sets, qualifications and experience of the personnel/institutions engaged to conduct the standardized tests/data collection exercise adequate?	<p>No standardized test has been applied for monitoring of any parameters for the CPA under verification. This is in accordance with the registered PoA-DD/CPA-DD /B04/.</p> <p>Through the remote interview of personnel responsible for carrying out the monitoring survey it was ascertained that the personnel are competent to conduct the survey and follow the instructions and requirements of CME management manual /18/. Furthermore, the VT also reviewed the training certificates of the personnel and ascertained that they are trained every year before undertaking the monitoring survey to refresh their skills. The same is found acceptable by VT.</p>
17.	<p>Does the PP have a process in place to ensure data quality is maintained to a high standard? This should include:</p> <ol style="list-style-type: none"> Are the personnel trained and experienced? What is the level of supervision and guidance provided to staff? Is there a standardized system for data entry and analysis to produce final result? Is there a system or process in place to minimize the introduction of errors? Is there a system in place to ensure all collected data is processed; Are quality checks performed on data entered, for example range checks, inconsistency checks, checking of subsamples of data by supervisors; is there a system to check for errors, record and report errors reported and document the remedial action taken; What is the level of security and type of backup processes to guarantee data integrity, for example methods to prevent fraud and accidental deletion? 	<p>Verification team based on review of provided supporting documents and remote interviews confirms the following:</p> <ul style="list-style-type: none"> ✓ The personnel involved in the surveys are trained and experienced. ✓ There exists a standardized system for data entry and analysis to produce final result. ✓ There exist a system or process in place to minimize the introduction of errors. ✓ There is a system in place to ensure all collected data is processed. ✓ There exists a quality checks of data entered.

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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
04.0	6 April 2021	Revision to: <ul style="list-style-type: none"> • Reflect the “Clarification: Regulatory requirements under temporary measures for post-2020 cases” (CDM-EB109-A01-CLAR).
03.0	31 May 2019	Revision to: <ul style="list-style-type: none"> • Ensure consistency with version 02.0 of the “CDM validation and verification standard for programmes of activities” (CDM-EB93-A08-STAN); • Make structural and 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).
01.0	5 June 2015	Initial publication.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: programme of activities, verifying and certifying		