




**Verification and certification report form for
CDM programme of activities
(Version 03.0)**

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

BASIC INFORMATION

Title and UNFCCC reference number of the programme of activities (PoA)	SHINE-Distribution of LED Lightbulbs in India UNFCCC Ref.No.- 10484	
Version number(s) of the PoA-DD(s) to which this report applies	07	
Version number of the verification and certification report	3.0	
Completion date of the verification and certification report	06/10/2020	
Monitoring period number and duration of this monitoring period	First (12/01/2020- 15/03/2020)	
Number and version number of the monitoring report to which this report applies	Number: 01 Version: 3	
Coordinating/managing entity (CME)	Brightspark Energy Private Limited	
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-II.C- Demand-side energy efficiency activities for specific technologies, Version 15.0	
Mandatory sectoral scopes	Sectoral Scope 3: Energy demand	
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	2,338 tCO ₂ e	
Certified amount of GHG emission reductions or GHG removals for this monitoring period for the included CPAs covered in this report	2,121 tCO ₂ e	
Name and UNFCCC reference number of the DOE	Earthood Services Private Limited E-0066	
Name, position and signature of the approver of the verification and certification report	 Dr. Kaviraj Singh Managing Director	

SECTION A. Executive summary

PoA aims at replacing the in-efficient incandescent lightbulbs ("ICLs") and fluorescent lamps (FLs), with more energy efficient LED lamps/tubes in India. The usage of distributed LED bulbs leads to reduction of fossil-fuel based electricity consumption and thereby contributing to the reduction of green-house gas emissions.

Brightspark Energy Pvt Ltd is the CME for the PoA, which is currently the only CME. Ecoeye Co., Ltd., ("Ecoeye") and Korean Impact Carbon Corporation ("KICC") have fully financed all LED bulbs distributed to the households of included CPAs, and the total project cost per LED bulb is USD 1.65 including the cost of a LED/17/. Ecoeye and KICC are also the CPA implementers of the CPAs under verification.

The PoA targets only for grid connected consumers who voluntarily decided to be a part of this programme. The PoA has reduced 2,121 tCO₂e during the current monitoring period (12/01/2020- 15/03/2020).

Scope of Verification:

The verification is an independent and objective review and ex-post determination of the monitored reductions in GHG emissions by the DOE. The verification includes review of implementation and operation of the PoA as set out in the registered PoA-DD & CPA-DDs viz., 10484-P1-0001-CP1, 10484-P1-0002-CP1, 10484-P1-0003-CP1, 10484-P1-0004-CP1 in the monitoring period.

The verification tests the data and assertions set out in the monitoring report prepared for this monitoring period by the CMEs and is based on the following:

- (i) The approved methodology AMS II.C version 15 "Demand-side energy efficiency activities for specific technologies", applied in the POA-DD/1/ & CPA-DDs/2-5/
- (ii) The registered and approved PoA-DD & CPA-DD and monitoring plan
- (iii) UNFCCC criteria referred to in the Kyoto Protocol criteria and the CDM modalities and procedures as agreed in the Bonn Agreement and the Marrakech Accords
- (iv) The CDM Validation and Verification Standard (VVS) for PoA, version 2.0/7/
- (v) The CDM Project Standard (PS)/8/ and Project Cycle Procedure (PCP) for PoA version 2.0/9/
- (vi) Relevant decisions, guidance and clarifications of the CMP and CDM Executive Board and any other information and references relevant to the project activity's reported emission reductions

The verification has considered both quantitative and qualitative aspects on stated/reported emission reductions. The monitoring report (all versions) and corresponding supporting documentation was assessed in accordance with the rules defined by UNFCCC, as appropriate to the PoA. The verification is not meant to provide any consulting or recommendations to the CME/others. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the monitoring activities.

Verification Process:

The verification process is conducted as per internal CDM Quality Manual, which includes the following steps.

- a) Contract with Brightspark Energy Private Ltd. and appointment of verification team and technical review team (refer Section B.1 and B.2 of this report)
- b) Completeness check of Monitoring Report
- c) Publication of Monitoring Report at UNFCCC website
- d) Desk review (refer Section D.1 of this report) of Monitoring Report and corresponding ER sheet by verification team and planning of onsite audit (including sampling approach (refer Section C of this report) to be applied)
- e) On site audit (refer Section D.2 of this report) (physical implementation and interview with relevant stakeholders) by verification team consistent of Team Leader and all Technical Experts, as a minimum
- f) Follow up activities e.g., interviews (refer Section D.3 of this report)
- g) Reporting and closure of findings (CARs/CLs/FARs) and preparation of draft verification report (refer Section D.5 of this report)
- h) Independent technical review of the draft verification report and final/revised documentation (e.g., Monitoring Report, corresponding ER sheet and evidences)
- i) Reporting and closure of TR comments/findings (refer Section D.5 of this report) (CARs/CLs/FARs) and final approval for the decision made (refer Section G and H of this report).

- j) Issuance of final verification report to contracted CME (or authorized representatives) and submission of request for issuance, as appropriate.

Verification Conclusion:

Based on the outcome of the verification process of the registered PoA “SHINE-Distribution of LED Light Bulbs in India” and its 4 CPAs (10484-P1-0001-CP1, 10484-P1-0002-CP1, 10484-P1-0003-CP1, 10484-P1-0004-CP1), for the monitoring period **12/01/2020 – 15/03/2020** (including both dates) we confirm that the implementation of referenced registered PoA and CPAs is complying with applicable CDM rules and regulations. The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodologies, AMS II.C Version 15 and the monitoring plan contained in the PoA-DD and the CPA DDs.

Earthood Services Private Limited is able to certify that the emission reductions from the registered CDM PoA “SHINE-Distribution of LED Light Bulbs in India” in India having UNFCCC reference 10484 during the period 12/01/2020 – 15/03/2020 (including both days) amount to 2,121 tCO₂e. Therefore, this is being submitted for request for issuance, as per UNFCCC procedures.

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	IR	Mahala	Deepika	Central Office	Y	N*	Y	Y
2.	Meth Expert	IR	Kumar	Sanjeev	Central Office	Y	N*	N	N
3.	Technical Expert	IR	Mahala	Deepika	Central Office	Y	N*	Y	Y
4.	Verifier	IR	Vatsa	Vaishali	Central Office	Y	N*	Y	Y
5.	Verifier	IR	Sahni	Rahi	Central Office	Y	N*	Y	Y
6.	Local Expert	IR	Mahala	Deepika	Central Office	Y	N*	Y	Y

*Remote telephonic survey was conducted instead of physical on-site audit. Details for remote on-site survey have been discussed in detail in section D.2 of the report.

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	Gautam	Ashok	Central Office
2.	TA to TR	IR	Gautam	Ashok	Central Office
3.	Approver	IR	Singh	Kaviraj	Central Office

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.	Error in Data Transfer from	Low	CME enters the data in	Since most of the monitoring

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	Digital Records, Hard copy Records to ER Spread sheet for the monitoring parameters and sampling survey results. The errors could result from human errors during the information transfer from the source to emission reduction sheet.		calculation of ERs as available through survey/sampling. The monitored parameters are used in the calculation of emission reductions.	parameter is confirmed through ex post monitoring survey conducted by CME, the verification team checked and verified the 44 households from ex post monitoring survey and project database on sampling basis. The operational rate of LEDs and sample surveys for other parameters (hard copies) were also checked. PoA-DD, CPA-DD and reference documents are also compared with ER spread sheet to check for any material error during data transfer. Interview were also conducted to the end users to confirm the primary data on sampling basis.
2.	Erroneous consideration of fixed parameters, error in calculation.	Low	The details of the parameters fixed ex-ante are provided in PoA-DD/CPA-DD used for emission reduction calculation.	All parameters are checked from the registered documents (i.e. CPA-DD/PoA/DD). The formula used are also checked from the registered documents.

C.2. Consideration of materiality in conducting the verification

Prescribed range of ERs/annum	500,000 or more	300,001 to 499,999	300,000 or less	PoAs comprising only small-scale CPAs	PoAs comprising only micro-scale CPAs
Prescribed threshold	0.5%	1.0%	2.0%	5.0%	10.0%

The identified/selected materiality threshold for the PoA under current monitoring period is 10% as PoA is microscale in accordance with para 308 of CDM VVS for PoA, Version 2.0/7/.

	MR Version (Public)	MR Version (Final)*
Emission reductions	2,325	2,121
Identified Threshold	10.0%	10.0%

Monitored Parameter (Symbol / Description)	Reporting Frequency	Number of Discrete Data (Total) Total (100%)	Sample selected for verification Sample (100%)	Type of error identified	Impact on ERs	
					ERs impacted (Sample)	ERs impacted (Population based on extrapolation)
10484-P1-0001-CP1, 10484-P1-0002-CP1, 10484-P1-0003-CP1, 10484-P1-0004-CP1						
Ni baseline (60W)/(100W) Number of pieces of baseline lamps	Once at the time of project Implementation	167,732	100%	None	NA	NA

replaced.						
Π_i baseline scrapped (60W)/(100W) Number of pieces of baseline lamps destroyed	Once at the time of project Implementation	168,625	100%	None	NA	NA
Π_i project (9W)/(12W)/(14W) Number of pieces of 9W/12W/14W project lamps distributed	Once at the time of project Installation	168,188	100%	None	NA	NA
Π_i operational (9W)/(12W)/(14W) Total number of 9W/12W/14W project lamps that are operational during monitoring period	Annual	167,732 ¹ * 156 for CPA1+ 110 for CPA2 +78 for CPA3 + 55 for CPA4 (checked samples)	44(4*11)	None	NA	NA
O_i project (9W)/(12W)/(14W) / baseline (60W)/(100W) Average annual operating hours of type 'i' project /baseline lamp	Once concurrent with first ex-post monitoring	160 for CPA1+ 165 for CPA2 + 158 for CPA3 + 160 for CPA4	44(4*11)	None	NA	NA
ρ_i baseline 60W, 100 W Rated power of 60 W & 100 W baseline lamps replaced	Once at the time of project Installation	167,732	100%	None	NA	NA
ρ_i project 9W, 12W, 14W Rated	Once at the time of project	167,732	100%	None	NA	NA

¹ Survey agency had calculated the LEDs to be surveyed in accordance to "Guideline-Sampling and surveys for CDM project activities and programmes of activities" for each type of LEDs. Further number of sample households were identified based on the average number of LEDs distributed per households and those randomly selected households were surveyed. That is why the number of each type of LEDs surveyed is more than the calculated numbers (fulfilling the minimum number requirement). DOE has tallied and verified these numbers in MR and from the survey sheet submitted.

power of the LEDs of 9W, 12W and 14W project lamps (Watts)	Installation					
Ly Average annual technical grid losses	-	1	1	None	NA	NA

The verification team confirms that the final total ERs claimed in the MR under verification are free from material errors.

SECTION D. Means of verification

D.1. Desk/document review

The desk review involves;

- A review of the data and information presented to verify their completeness;
- A review of the monitoring plan, the monitoring methodology including applicable tool(s) and, where applicable, the applied standardized baseline, paying particular attention to the frequency of measurements, the quality of metering equipment including calibration requirements, and the quality assurance and quality control procedures;
- A review of calculations and assumptions made in determining the GHG data and emission reductions;
- An evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions;

The list of documents/evidences reviewed during the verification is provided under Appendix 3 of this report.

D.2. On-site inspection

Duration of on-site inspection: NA*				
No.	Activity performed on-site	Site location	Date	Team member
1.	Interview of the monitoring personnel and CME representative	-	13/05/2020-15/05/2020	Deepika Mahala and Vaishali Vatsa
2.	Interview of the end-users related to the deployed project devices	-	13/05/2020-15/05/2020	Deepika Mahala and Vaishali Vatsa
3.	Interview with the households with run time meters for operating hours	-	16/06/2020	Deepika Mahala and Vaishali Vatsa

*No site-visit was conducted, alternative means were adopted under which remote survey was also conducted.

Mandatory Site-Visit:

The site-visit for the current verification was mandatory, time in-line to para 321 VVS-PoA Version 2.0/7/, because there were 4 new CPAs (10484-P1-0001-CP1, 10484-P1-0002-CP1, 10484-P1-0003-CP1, 10484-P1-0004-CP1) that are being verified for the first.

Planned Site-Visit:

The site-visit was initially planned from 13/05/2020- 15/05/2020. However, due to COVID outbreak various state govt as well as Government of India at national level has started giving advisories against any kind of travel and conglomerations from the beginning of March 2020. Subsequently nation-wide lockdown was imposed, by the Government of India across the country, starting from 24th March,2020. Therefore, the site-visit couldn't not be conducted and put on hold.

Issue with the postponement of Site-visit:

The site-visit for this verification could not be postponed any further because this would lead to delayed issuance of the CERs. The CME relies upon the CER revenue generated from the project as the working

capital of the project. It was clarified by the CME that along with the impact on the working capital of the project, the delay might also cause ERDA/17/ being cancelled. In light of the argument and evidence made available by the CME, the assessment team concluded the postponing the site visit may risk the continuity and survival of the program.

Exemption by CDM EB

Because of COVID-19 situation an exemption for the site-visits scheduled from 23/03/2020- 23/06/2020 was provided, with the option of applying alternative means by the DOE, by CDM EB. ESPL assessment team has used a dedicated checklist prepared for the application of alternative means for verifying the project related details. The summary and outcome of the application of the alternative means of site visit by the auditor has been provided in different section of this report.

Alternative means applied

Following alternative means have been used to verify the project details:

1. Remote Survey including CME/CPA Implementer, end users and the personnel's involved in monitoring and preparation of the monitoring report and related documents. Random samples for 44 LED user (details on sampling provided in section D.3) were drawn from the sample survey sheet and interviewed through audio calls.
2. Photographic evidences of the monitoring equipment, Run-time meters, Monitoring Survey (Filled) sheets and LED Bulbs with project logo
3. Screenshots of computer assisted personal interview (CAPI)
4. Monitoring personnel certificates copies
5. E-videos of ICL Destruction
6. Review of Other Documentary evidences (ER sheet, Usage and monitoring sheet, Sample Size sheet, ICL destruction Certificate)

D.3. Interviews²

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Garg	Vineet	CQC	13/05/2020-14/05/2020	Monitoring Plan, Project Implementation,	Deepika Mahala, Vaishali Vatsa
2.	Goswami	Tridip	CQC	13/05/2020-14/05/2020	ER calculation and Monitoring Report (Via Skype)	Deepika Mahala
3.	Das	Kishore	CQC	15/05/2020	Monitoring Survey	Deepika Mahala, Vaishali Vatsa
4.	-	Imran	Vendor to CME	13/05/2020-15/05/2020	Monitoring Survey	Deepika Mahala, Vaishali Vatsa
5.	-	Prashanth	Vendor to CME	13/05/2020-14/05/2020	Monitoring Survey	Deepika Mahala, Vaishali Vatsa
Sampling for end users						
6.	Pal	Kirshan	End-user	13/05/2020	DOE Remote Survey	Deepika Mahala

² Via Skype or Audio Phone calls

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7.	-	Jagmohan	End-user	13/05/2020	DOE Remote Survey	Deepika Mahala
8.	-	Mustakeem	End-user	13/05/2020	DOE Remote Survey	Deepika Mahala
9.	Mehar	Alla	End-user	13/05/2020	DOE Remote Survey	Deepika Mahala
10.	Kumar	Ram	End-user	13/05/2020	DOE Remote Survey	Deepika Mahala
11.	Pal	Ram	End-user	13/05/2020	DOE Remote Survey	Deepika Mahala
12.	Singh	Feru	End-user	13/05/2020	DOE Remote Survey	Deepika Mahala
13.	-	Birshpal	End-user	13/05/2020	DOE Remote Survey	Deepika Mahala
14.	Dutt	Prem	End-user	13/05/2020	DOE Remote Survey	Deepika Mahala
15.	-	Vineet	End-user	13/05/2020	DOE Remote Survey	Deepika Mahala
16.	-	Sandeep	End-user	13/05/2020	DOE Remote Survey	Deepika Mahala
17.	Somakka	Kagu	End-user	14/05/2020	DOE Remote Survey	Deepika Mahala
18.	-	Upendar	End-user	14/05/2020	DOE Remote Survey	Deepika Mahala
19.	Venkanna	Enugonda	End-user	14/05/2020	DOE Remote Survey	Deepika Mahala
20.	-	Chandraiah	End-user	14/05/2020	DOE Remote Survey	Deepika Mahala
21.	Uppalachary	Alloju	End-user	14/05/2020	DOE Remote Survey	Deepika Mahala
22.	Vedhasree	Vemisetti	End-user	14/05/2020	DOE Remote Survey	Deepika Mahala
23.	Chandraiah	Endla	End-user	14/05/2020	DOE Remote Survey	Deepika Mahala
24.	Venkateshwarlu	Muddasani	End-user	14/05/2020	DOE Remote Survey	Deepika Mahala
25.	Venkateshwarlu	Udugula	End-user	14/05/2020	DOE Remote Survey	Deepika Mahala
26.	Mahesh	Maripelly	End-user	14/05/2020	DOE Remote Survey	Deepika Mahala
27.	Shekhar	Kotha Chandra	End-user	14/05/2020	DOE Remote Survey	Deepika Mahala
28.	Narsaiah	Ch Laxmi	End-user	13/05/2020	DOE Remote Survey	Vaishali Vatsa
29.	Kistaiah	H.	End-user	13/05/2020	DOE Remote Survey	Vaishali Vatsa
30.	Ravinder	Thummala	End-user	13/05/2020	DOE Remote Survey	Vaishali Vatsa
31.	Mallaih	M.Chinna	End-user	13/05/2020	DOE Remote Survey	Vaishali Vatsa
32.	Bharatham	G.	End-user	13/05/2020	DOE Remote Survey	Vaishali Vatsa
33.	Sadhanadham	P.	End-user	13/05/2020	DOE Remote Survey	Vaishali Vatsa
34.	Ramulu	K.	End-user	13/05/2020	DOE Remote Survey	Vaishali Vatsa
35.	Swami	Chinnabala	End-user	13/05/2020	DOE Remote Survey	Vaishali Vatsa
36.	Kasaraju	U	End-user	13/05/2020	DOE Remote Survey	Vaishali Vatsa
37.	Kistaiah	M.	End-user	13/05/2020	DOE Remote	Vaishali

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					Survey	Vatsa
38.	Narsimlu	Gurralla	End-user	13/05/2020	DOE Remote Survey	Vaishali Vatsa
39.	Debnath	Haridhan	End-user	15/05/2020	DOE Remote Survey	Vaishali Vatsa
40.	Nath	Paramashar	End-user	15/05/2020	DOE Remote Survey	Vaishali Vatsa
41.	Nath	Sujit	End-user	15/05/2020	DOE Remote Survey	Vaishali Vatsa
42.	Nath	Harendra	End-user	15/05/2020	DOE Remote Survey	Vaishali Vatsa
43.	Debnath	Rabindra	End-user	15/05/2020	DOE Remote Survey	Vaishali Vatsa
44.	Sarma	Rashmohan	End-user	15/05/2020	DOE Remote Survey	Vaishali Vatsa
45.	Paul	Mukul	End-user	15/05/2020	DOE Remote Survey	Vaishali Vatsa
46.	Debnath	Subal	End-user	15/05/2020	DOE Remote Survey	Vaishali Vatsa
47.	Nath	Prafulla	End-user	15/05/2020	DOE Remote Survey	Vaishali Vatsa
48.	Sukalabadya	Bakul	End-user	15/05/2020	DOE Remote Survey	Vaishali Vatsa
49.	Das	Upendra Kumar	End-user	15/05/2020	DOE Remote Survey	Vaishali Vatsa

Sampling for Run time meter

50.	Waheed	Mohmmad	Run-time meter Sample (Baseline Lamp), CPA-1	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
51	Ramesh	N.	Run-time meter Sample (Baseline Lamp), CPA-1	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
52	Nagedram	N.	Run-time meter Sample (Baseline Lamp), CPA-1	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
53		Quthubuddhin	Run-time meter Sample(Baseline Lamp), CPA-1	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
54	Khan	Ismail	Run-time meter Sample(Baseline Lamp), CPA-1	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
55	Rahemuiddin	Md.	Run-time meter Sample(Baseline Lamp), CPA-1	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
56	Anasuya	N.	Run-time meter Sample(Baseline Lamp), CPA-1	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
57	Mallesham	K.	Run-time meter Sample(Baseline Lamp), CPA-1	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
58	Devendar	Mogulla	Run-time meter Sample(Baseline	16/06/2020	DOE Remote Survey	Deepika Mahala

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			Lamp), CPA-1			Vaishali Vatsa
59	Mallesham	Bomma	Run-time meter Sample(Baseline Lamp), CPA-1	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
60	Narsamma	Babbari	Run-time meter Sample(Baseline Lamp), CPA-1	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
61	Nath	Ripan	Run-time meter Sample(Baseline Lamp), CPA-2	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
62.	Nath	Bisheswar	Run-time meter Sample(Baseline Lamp), CPA-2	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
63.	Nath	Biplab Deb	Run-time meter Sample(Baseline Lamp), CPA-2	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
64.	Nath	Kulbhushan Deb	Run-time meter Sample(Baseline Lamp), CPA-2	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
65.	Nath	Anup Kumar	Run-time meter Sample(Baseline Lamp), CPA-2	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
66.	Nath	Mohan Chandra	Run-time meter Sample(Baseline Lamp), CPA-2	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
67.	Nath	Binoy	Run-time meter Sample(Baseline Lamp), CPA-2	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
68.	Debnath	Nani Gopal	Run-time meter Sample(Baseline Lamp), CPA-2	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
69.	Chandra Nath	Dipak	Run-time meter Sample(Baseline Lamp), CPA-2	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
70.	Nath	Sukanta Deb	Run-time meter Sample(Baseline Lamp), CPA-2	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
71.	Nath	Nripendra	Run-time meter Sample(Baseline Lamp), CPA-2	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
72.	Tiwari	Amit Kumar	Run-time meter Sample(Baseline Lamp), CPA-3	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
73.	Bhatiya	Hitesh	Run-time meter Sample(Baseline Lamp), CPA-3	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa

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74.	Kumar	Arvind	Run-time meter Sample(Baseline Lamp), CPA-3	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
75.	Kumar	Arnu	Run-time meter Sample(Baseline Lamp), CPA-3	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
76.	Ray	Mahesh	Run-time meter Sample(Baseline Lamp), CPA-3	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
77.	Ray	Raj Kumar	Run-time meter Sample(Baseline Lamp), CPA-3	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
78.	Narayan	Satya	Run-time meter Sample(Baseline Lamp), CPA-3	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
79.	Sharma	Om Prakash	Run-time meter Sample(Baseline Lamp), CPA-3	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
80.	Singh	Jitender	Run-time meter Sample(Baseline Lamp), CPA-3	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
81.	Devi	Poonam	Run-time meter Sample(Baseline Lamp), CPA-3	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
82.	Kumar	Arun	Run-time meter Sample(Baseline Lamp), CPA-3	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
83.	Ashok	Kadunuri	Run-time meter Sample(Baseline Lamp), CPA-4	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
84.	-	Somalaxmi	Run-time meter Sample(Baseline Lamp), CPA-4	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
85.	G.	Chandraiah	Run-time meter Sample(Baseline Lamp), CPA-4	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
86.	Ravi	Kanatam	Run-time meter Sample(Baseline Lamp), CPA-4	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
87.	L.	Satanarayana	Run-time meter Sample(Baseline Lamp), CPA-4	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
88.	B..	Ramulu	Run-time meter Sample(Baseline Lamp), CPA-4	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
89.	T.	Venkateshwarlu	Run-time meter Sample(Baseline	16/06/2020	DOE Remote Survey	Deepika Mahala

			Lamp), CPA-4			Vaishali Vatsa
90.	Kishan	Bhukya	Run-time meter Sample(Baseline Lamp), CPA-4	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
91.	Anjaiah	Kinnera	Run-time meter Sample(Baseline Lamp), CPA-4	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
92.	K.	Panthulu	Run-time meter Sample(Baseline Lamp), CPA-4	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa
93.	S.	Somaiah	Run-time meter Sample(Baseline Lamp), CPA-4	16/06/2020	DOE Remote Survey	Deepika Mahala Vaishali Vatsa

D.4. Sampling approach

CME Sampling Approach

A simple random sampling plan was carried out as a part of SSC-CPA-wide Sampling Plan for all specific case CPAs covered in this monitoring period. The CME has applied Simple random Sampling separately for four CPAs for different monitoring parameters as per validated PoA DD and CPA DDs. 95/10 confidence precision was mainly applied by CME in the sampling, which is better than the 90/10 confidence precision prescribed in sampling tool. The confidence and precision level applied by the CME meets the methodological requirements. The sampling approach undertaken by CME is duly explained under Section B.1 of monitoring report.

DOE's Sampling Approach

In order to meet the requirements of Standard for Sampling and surveys for CDM project activities and programmes of activities, the verification team applied acceptance sampling in the verification. The verification team selected random samples of CME's sampled records, checked the acceptability (or otherwise) of the data for each such record with CME's sample records, and then based on the number of records where there is agreement, determined if the CME's sample records meet the requirements.

According to para 30 of Standard for Sampling and surveys for CDM project activities and programmes of activities, Version 8 /26/ , The maximum errors associated with the determination have been kept at following level:

- (a) A 10 per cent chance that the DOE will wrongly reject the project participants' or the coordinating/managing entity's records (i.e. reject a set of records of acceptable quality);
- (b) A 10 per cent chance that the DOE will wrongly accept the project participants' or the coordinating/managing entity's records (i.e. accept a set of records which is unacceptable).

Verification team has applied following AQL and UQL level using its own judgement:

0.5% AQL- Acceptable quality level (AQL) or the level of assurance, that is the proportion of acceptable discrepancies between the project participants' or the coordinating/managing entity's sample records and the DOE sample records

20% UQL- Unacceptable quality level (UQL), that is the proportion of unacceptable discrepancies between the project participants' or the coordinating/managing entity's sample records and the DOE sample records

The current verification is for 10484-P1-0001-CP1-10484-P1-0004-CP1.

Considering the above input values, a sample size of 11 (for each of the CPA i.e., total 44 samples) were required as per Table 1 in the referred Standard for the monitoring period.

The CME has conducted two different samplings for the following two parameters:

- O_i project (Operating hours of replaced ICL lamps or installed LEDs using run time meters)
- N_i operational (Number of operational project lamps during the monitoring period)

Since the populations and samples visited by CME for the two parameters were different, the DOE covered 44 samples for each parameter (11 for each CPA). i.e., total 88 samples.

As discussed under section D.2 of the report, the remote site visit was chosen as an alternative means for not covering the samples physically. All the households had same answer as reported in the survey sheet. thus, no discrepancy was observed. Accordingly, Acceptance number (c) thus determined for the sample size is 0 and a sample size of 11 meets the criteria in line with "Standard for Sampling and surveys for CDM project activities and programmes of activities, Version 8,"/26/.

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	-	CAR#01	-
Remaining forward action requests from validation and/or previous verifications	-	-	-
CPAs considered for verification and covered in this report	-	-	-
Programme of activities	-	-	-
Compliance of the programme implementation with the registered PoA-DD	CL#03	-	-
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	CL#01 CL#03	CAR#02 CAR#03	-
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 activities	-	-	-
Compliance of the registered monitoring plan with applied methodologies and standardized baselines	-	-	-

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).

Compliance of monitoring activities with the registered monitoring plan	-	-	-
• Data and parameters fixed ex ante or at renewal of crediting period	-	-	-
• Data and parameters monitored	CL#02 CL#04 CL#05 CL#06	CAR#02 CAR#04 CAR#05	
• Implementation of sampling plan	CL#04	CAR#03	-
Compliance with the calibration frequency requirements for measuring instruments	-	-	-
Assessment of data and calculation of emission reductions or net removals	-	-	-
• Calculation of baseline GHG emissions or baseline net GHG removals by sinks	-	-	-
• Calculation of project GHG emissions or actual net GHG removals by sinks	-	-	-
• Calculation of leakage GHG emissions	-	-	-
• Summary of calculation of GHG emission reductions or net GHG removals by sinks	-	-	-
• Comparison of actual GHG emission reductions or net GHG removals by sinks with estimates in included CPA	-	-	-
• Remarks on difference from estimated value in included CPA	-	-	-
Assessment of reported sustainable development co-benefits	-	-	-
Global stakeholder consultation	-	-	-
Others (please specify)	-	-	-
Total	06	05	00

SECTION E. Verification findings

E.1. General

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

Means of verification	Monitoring report is prepared using the correct and latest template available on UN-webpage for PoA i.e. CDM-PoA-MR-FORM Version 03.0/11/. The verification team confirms that the monitoring report has been appropriately prepared using the latest applicable monitoring report form/11/, and that all sections are completed.
Findings	CAR#01 was raised and resolved
Conclusion	Latest version of MR has been used and all the guidelines of the template have been followed by the CME to prepare the monitoring report.

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

No FAR was found to be raised during the validation and Inclusion of the CPAs.

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)
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SHINE – Distribution of LED Lightbulbs in India-1, 10484-P1-0001-CP1	Yes	11/01/2020	7.0	N*
SHINE – Distribution of LED Lightbulbs in India-2, 10484-P1-0002-CP1	Yes	11/01/2020	7.0	N*
SHINE – Distribution of LED Lightbulbs in India-3, 10484-P1-0003-CP1	Yes	11/01/2020	7.0	N*
SHINE – Distribution of LED Lightbulbs in India-4, 10484-P1-0004-CP1	Yes	11/01/2020	7.0	N*

* This is the first verification of the PoA. Thus, these CPAs are being verified for the first time.

E.2. Programme of activities

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

Means of verification	<p>The registered PoA involves distribution of LED bulbs in India. Brightspark Energy Pvt Ltd is the CME for the PoA, which is currently the only project participant. Brightspark Energy Pvt. Limited (BEPL) is the CME as checked from project webpage/14/ and interview of the CME and other monitoring personnel's/15/. This is consistent with the registered PoA-DD/1/. Ecoeye Co., Ltd. and other Korean entities are responsible for fully financing the implementation of included CPAs. Ecoeye Co. Ltd and Korean Impact Carbon Corporation are also the CPA implementers of the CPAs under verification. The CME with the help of the CPA Implementer and other financing parties (Ecoeye Co., Ltd and other Korean Companies) has implemented the CPAs as checked from the CME and financing party's agreement/13/. The overall distribution work of the project bulbs was undertaken by a third-party commissioned by the CME.</p> <p>The CPAs of the PoA involves distribution of LED bulbs:</p>			
	Technical Specification of the LED Bulbs:			
	Manufacturer	Crompton FIEM HPL	HPL	HPL
	Wattage (W)	9	12	14
	Lumen output (lm)	900	1,350	1,400
	Rated Lifetime (hours)	25,000	25,000	25,000
	Compliance with BIS	Yes	Yes	Yes
	<p>The specification for the LED Bulbs provided meets the eligibility requirements of the PoA-DD /1/ on page 39. The details were verified from the manufacturer specification/16/ provided by the CME. Each household is allotted a unique ID also known as UKSC no. which is same as their electricity bill no. Since, no two household can have same bill no, or say UKSC no., the double counting is avoided. At the time of installation of LED lamps, ICS lamps (baseline lamps) are also collected for destruction, thus meeting requirement stated under para 48 of applied methodology/6/.</p>			

The LEDs distributed under the PoA follow the Bureau of Indian Standards (BIS) mandated technical specifications i.e. IS 16102:2012 for self-ballasted LEDs or that of equivalent international standard/16/. Additionally, it was also confirmed that the lumen output of the project LEDs is between 90% to 150% of the lumen output of the baseline lamps under section of C.1. of the MR. Thus, meeting the criterion stated on page 18 of the PoA DD/1/ and also required by para 3 of applied methodology/6/.

The reported numbers of LEDs distributed in households in each CPA were cross verified with the online database/52/ hosted in <http://cqc.nirmalaentp.com/>, which is being populated by a mobile application using a smart phone/tablets through live entries. For ER calculation an excel sheet was imported from the database for each CPA/30/ and it was found that the number of LEDs in the excel sheet matches with the number of LEDs in the online database for the entire monitoring period.

During the interviews(44 samples) the installation of LED bulbs claimed by the PP were cross- checked from the officials involved in the project implementation and management and found to be in-line with the technical description provided in the PoA-DD/1/ and Monitoring report/10/ as well it was confirmed that the ICLs have been collected for destruction.

This monitoring period includes the implementation and monitoring of 4 CPAs as part of registered PoA. The implementation of all CPAs, as referenced above, are within the geographical boundary of PoA as mentioned in PoA DD/1/.

The total Number of LED bulbs and the start date of the LED /36/ deployed under each CPA is verified as following:

CPA (10484 -P1- 0001-CP1):

Wattage			Start date of LED distribution
14W	12W	9W	13/08/2018
4,906	0	73,204	

CPA (10484 – P1-0002-CP1):

Wattage			Start date of LED distribution
14W	12W	9W	27/11/2018
4,643	0	4,458	

CPA (10484 –P1- 0003-CP1):

Wattage			Start date of LED distribution
14W	12W	9W	06/03/2020
0	44,120	26,823	

CPA (10484 –P1- 0004-CP1):

Wattage			Start date of LED distribution
14W	12W	9W	05/10/2018
0	0	10,034	

The total products disseminated and ICLs collected under each CPA was confirmed through sales database/30/. The CME has also conducted surveys to determine the monitored parameters. Please refer to section E.3.4.2. and E.3.4.3. of this report for detailed assessment of the monitoring conducted by the CME.

The verification team checked selected number of samples through remote site visit to confirm the implementation of the project in line with PoA DD/1/ and the CPA DDs/2-5/. During the remote survey, the installation of LEDs claimed by the CME were checked by interviewing the end-users (44 samples) and confirming the product description and the replaced ICLs.

The verification team after reviewing the evidences shared by the CME and through

	<p>the remote survey was able to confirm that the quantity, specification and target group of the LEDs is consistent with the PoA DD/1/ and respective CPA DDs/2-5/. The verification team confirms that:</p> <ul style="list-style-type: none">• The CPA(s) are implemented within the boundary of the PoA as described in the registered PoA-DD/1/.• The CME is same as that mentioned in the registered PoA-DD/1/• The implementation and operation of the project activity has been conducted in accordance with the description contained in the registered PoA-DD/1/ and included CPA-DDs/2-5/.• All physical features of the CPA proposed in the included CPA-DDs/2-5/ are in place.• The project participants/CPA implementer has operated the CPAs as per the included CPA-DDs/2-5/. <p>The emission reductions being claimed during this monitoring period are more than the estimated emission reductions in the registered CPA-DDs. and the reason for more achieved emissions is duly explained under section E.3.6.5. and E.3.6.6. of this report.</p> <p>The exact figures are given in the table below:</p> <table><tr><th>CPA UNFCCC reference number</th><th>Amount achieved during this Monitoring period (t CO₂e)</th><th>Amount estimated ex ante (t CO₂e)</th></tr><tr><td>10484-P1-0001-CP1</td><td>1,547</td><td>1,663</td></tr><tr><td>10484- P1-0002-CP1</td><td>250</td><td>207</td></tr><tr><td>10484- P1-0003-CP1</td><td>128</td><td>251</td></tr><tr><td>10484- P1-0004-CP1</td><td>196</td><td>217</td></tr><tr><td>Total</td><td>2,121</td><td>2,338</td></tr></table> <p>The information (including data and variables) as mentioned in the MR/10/ is found to be in line with the details provided in the PoA-DD/1/.</p> <p>The verification team found the project description contained in the registered PoA-DD/01/ to be complete and accurate. The monitoring report was compared and verified against the PoA-DD/1/ and was found in line with it.</p>	CPA UNFCCC reference number	Amount achieved during this Monitoring period (t CO ₂ e)	Amount estimated ex ante (t CO ₂ e)	10484-P1-0001-CP1	1,547	1,663	10484- P1-0002-CP1	250	207	10484- P1-0003-CP1	128	251	10484- P1-0004-CP1	196	217	Total	2,121	2,338
CPA UNFCCC reference number	Amount achieved during this Monitoring period (t CO ₂ e)	Amount estimated ex ante (t CO ₂ e)																	
10484-P1-0001-CP1	1,547	1,663																	
10484- P1-0002-CP1	250	207																	
10484- P1-0003-CP1	128	251																	
10484- P1-0004-CP1	196	217																	
Total	2,121	2,338																	
Findings	CL#03 was raised and resolved																		
Conclusion	<p>The verification team confirms that</p> <ul style="list-style-type: none">• The physical features (LED bulb) of the implementation were in accordance with the registered PoA-DD/01/.• The distribution of LED bulb is completed and the maximum limit of the LEDs to be distributed under each CPA i.e. 6 per households as given in the respective CPA-DDs were found to be followed.• The actual operation is in line to the respective CPA-DDs/2-5/, which is further explained under Section E.3 of this report.• The total number of CERs achieved for 1 CPA (10484-P1-0002-CP1) is more than the estimated ERs for the same period. The reason for increase in the achieved ERs is the higher operating hours as compared to the operating hours estimated for the ex-ante calculation. The total actual CERs for CPAs (combined) were high for comparable monitoring period.• The difference in emission reductions achieved for each specific case CPA DD in comparison to the estimated quantity in the registered CPA DD are justified in detail under section E.3.6.5 and E.3.6.6. of this report.																		

E.2.2. Implementation and operation of the management system

Means of verification	The verification team through the interview of the CME personnel and O&M personnel during the telephonic call (as listed under section D.2) assessed the management systems in place to implement the monitoring of the PoA. This included the roles and responsibilities, data collection, transfer and aggregation procedures, data storage and archiving for the monitoring system as mentioned
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	under section D of the MR (Version 3 /10/. The implementation of the operational and management system was cross-checked from the evidences such as the database server/52/. The assessment team has also checked training credentials of the monitoring & data recording personnel /34/, ICL replacement records /30/ and the sales data records /30/. The roles and responsibilities, data collection, transfer and aggregation procedures, data storage and archiving for the monitoring system have been provided in the MR /10/.
Findings	No findings were raised
Conclusion	The monitoring plan as contained in respective CPA DDs/2-5/ were reviewed against the monitoring requirements of the applied methodology AMS-II.C. version 15 /06/ as well as PoA DD/01/ with reference to the technology involved. The verification team confirms that the monitoring management system of the PoA is in place with the responsibilities properly identified and established and the monitoring plan is in accordance with the applied methodology AMS-II.C. version 15 /6/.

E.2.3. Post-registration changes

E.2.3.1. Corrections

N/A

E.2.3.2. Inclusion of a monitoring plan

N/A

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

N/A

E.2.3.4. Changes to the programme design

N/A

E.2.3.5. Addition of CPA inclusion template

N/A

E.2.3.6. Change of coordination/managing entity

N/A

E.2.3.7. Changes specific to afforestation and reforestation activities

N/A

E.3. Component project activities

E.3.1. Compliance of the CPA implementation with the included CPA design document

Means of verification	The CPAs are grouped in this section (i.e., Section E.3) for the purpose of verification and reporting as these are of similar nature (technology). The CPAs involve the installation of LEDs to reduce fossil-fuel based electricity consumption in the lighting usage of India's residential and commercial sector. There are four CPAs (10484-P1-0001-CP1, 10484-P1-0002-CP1, 10484-P1-0003-CP1 & 10484-P1-0004-CP1 under the PoA) implemented by Brightspark Energy Pvt Ltd./35/ which is being verified during the current monitoring period. The same has been confirmed during the interview of the CME and also from the Sales database /30/. The product is disseminated in residential and commercial sectors of India. It
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was also verified through the interview and from the installed project light videos that the LED lights were distributed and installed in the domestic premises where installation of LED is not possible due to unawareness and high cost.

The CPA implementers in all the four CPAs are:

- 1) Brightspark Energy Private Ltd. (also the CME)
- 2) Ecoeye Co. Ltd.
- 3) Korea Impact Carbon Corporation

The roles and responsibilities were confirmed from ERDA Contract (Emissions Reduction Development Funding Agreement between C-Quest Capital LED Asia Ltd. and Ecoeye Co., Ltd. and Korea Impact Carbon Corporation) /17/ Brightspark Energy Private Limited is a provider of project management services for C-Quest Capital's projects in Africa and Asia as confirmed from corporate organization structure of CQC/51/.

The implementation status of the LED bulbs under the 4 CPAs were checked through the remote surveys. Site-visit was avoided due to the pandemic situation around the globe and the same has been explained in detail under section D.2. of the report. Thereby, following the alternative means for verifying the project related details as described under section D.2. LED Bulbs installed by the CME as observed through the evidences shared by CME during the desk review and photos provided during the remote survey, which is in-line to the PoA-DD/1/.

The CPAs of the PoA involves the distribution of LED light bulbs replacing the ICLs:

Technical Specification of the LED Bulbs:			
Manufacturer	Crompton FIEM HPL	HPL	HPL
Wattage (W)	9	12	14
Lumen output (lm)	900	1,350	1,400
Rated Lifetime (hours)	25,000	25,000	25,000
BIS Compliance	Yes	Yes	Yes

The specification for the LED bulbs mentioned meets the eligibility requirements stated in the PoA-DD on page 41 /1/. The LEDs distributed under the PoA follow the Bureau of Indian Standards (BIS) mandated technical specifications i.e. IS 16102:2012 for self-ballasted LEDs or that of equivalent international standard/16/. Additionally, it was also confirmed that the lumen output of the project LEDs is between 90% to 150% of the lumen output of the baseline lamps under section of C.1. of the MR. Thus, meeting the criterion stated on page 18 of the PoA DD/1/ and also required by para 3 of applied methodology/6/. The details were verified from the technical specification document provided by the CME/16/.

The verification team has conducted remote site visit to confirm the implementation of CPAs in line with the CPA DDs/2-5/. The remote site visits involved telephonic calls. During the telephonic call, interviews with the end users, the CME representatives and other project personnel involved in the implementation of PoA confirmed the installation of LED bulbs claimed by the CME and ICLs collected and destructured by CME and found to be in-line with the technical description provided in the PoA-DD/1/ and Monitoring report/10/.

The monitoring period in this monitoring report is from 12/01/2020 to 15/03/2020. The details of each CPA are as follows:

CPA Ref.	Inclusion date	Start date of the CPA	Crediting period start date	Project Device	Total LED sold		
SHINE – Distribution of LED Lightbulbs in India-1, 10484-P1-	11/01/2020	13/08/2018	12/01/2020	LED Bulb	Wattage		
					14W	12W	9W
					4,906	0	73,204

0001-CP1								
SHINE – Distribution of LED Lightbulbs in India-2, 10484-P1-0002-CP1	11/01/2020	27/11/2018	06/03/2020	LED Bulb	Wattage			
					14W	12W	9W	
					4,643	0	4,458	
SHINE – Distribution of LED Lightbulbs in India-3, 10484-P1-0003-CP1	11/01/2020	06/03/2020	12/01/2020	LED Bulb	Wattage			
					14W	12W	9W	
					0	44,120	26,823	
SHINE – Distribution of LED Lightbulbs in India-4, 10484-P1-0004-CP1	11/01/2020	05/10/2018	12/01/2020	LED Bulb	Wattage			
					14W	12W	9W	
					0	0	10,034	

The difference in the actual LEDs sold and the LEDs considered for the CPAs have been explained below:

CPA-1 - There was no difference in the no. of LEDs sold and the no. of LEDs considered for ER calculation

CPA-2 - There was difference of 2 LEDs due to the issue in the application used for monitoring database (please refer to CL#03 for details under appendix 4 of this report)

CPA-3 - There is difference of few LEDs, because of software issue in the application. Due to this, more LEDs were distributed instead of 6 LEDs/HH and the same was recorded in the database automatically. The app issue was immediately corrected, but CME in order to be conservative and to meet the PoA-DD requirement of maximum 6 LEDs/HH has not considered these extra LEDs for the ER calculation. It has considered maximum of 6 LEDs/HH.

CPA-4 - There was no difference in the no. of LEDs sold and the no. of LEDs considered for ER calculation

The reference number, inclusion date of each CPA and crediting period start date of each CPA have been checked and verified from the UN website/14/ and the details were found to be correct and consistent. The start date of the CPAs was checked from the CPA_Database /30/ and the installation invoices of the first customer shared by the CME/36/.

The LEDs were distributed across geographical boundary of India. The location where the LEDs were distributed was verified from the geo-coordinates provided by the representative during the remote survey and was confirmed through documentary evidence provided during the current verification.

The wattage and number of LED sold is verified from the sales database/30/. DOE selected 11 samples for remote survey from each CPA (total 44 samples) by conducting random sampling /37/. The wattage and number of LEDs distributed were cross-verified for each of the HHs during the RSV. The team also checked the the website for the database/52/ recorded by the digital app at the time of distribution and monitoring/38/.

The description of the LED has been verified from the evidence shared by the CME like photographs/24/, technical description of the LEDs/16/ and also based on the confirmation from the remote-site inspection of the samples in order to assess that the physical features of

	<p>the LEDs as available in registered CPA-DDs/2-5/. The monitoring procedures are in place and the CME has operated the PoA & CPAs as per the registered PoA-DD/01/ and CPA-DDs/2-5/.</p> <p>Each of the independent subsystems/measures included in the CPA of a PoA is having following energy savings (MWh/year) per LED:</p> <table><tr><td></td><td>12W</td><td>14W</td><td>9W</td></tr><tr><td>CPA-1</td><td>-</td><td>0.198</td><td>0.118</td></tr><tr><td>CPA-2</td><td>-</td><td>0.213</td><td>0.126</td></tr><tr><td>CPA-3</td><td>0.200</td><td>-</td><td>0.116</td></tr><tr><td>CPA-4</td><td>-</td><td>-</td><td>0.121</td></tr></table> <p>The energy savings is less than 20GWh per year threshold. In-line to the CPA-DDs/2-5/ each of the CPAs under the PoA consists of micro-scale CDM units.</p> <p>Thus, the compliance of the CPA with the SSC threshold at aggregate CPA level is not required.</p> <p>Thus, the verification team confirms that the project has been implemented in the registered CPA DDs/2-5/.</p>		12W	14W	9W	CPA-1	-	0.198	0.118	CPA-2	-	0.213	0.126	CPA-3	0.200	-	0.116	CPA-4	-	-	0.121
	12W	14W	9W																		
CPA-1	-	0.198	0.118																		
CPA-2	-	0.213	0.126																		
CPA-3	0.200	-	0.116																		
CPA-4	-	-	0.121																		
Findings	CL#01,CAR #02,CAR#03 and CL#03 was raised and resolved.																				
Conclusion	<ul style="list-style-type: none">• The verification team is in opinion that physical features of the CPAs have been implemented in accordance with the registered CPA-DDs/2-5/.• No specific monitoring equipment had to be installed according to the monitoring plan.• It is also confirmed, through the review of the supporting documentation that physical features of the component CPAs have been implemented in accordance with the CPA-DDs/2-5/.• The CPAs were also found to be completely operational in line with the CPA-DDs/2-5/.• The information provided in the relevant sections of the monitoring report appropriately describe the implementation and operational status of the PoA.																				

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

No Changes observed

E.3.2.2. Corrections

No corrections observed

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

There are changes to the start date of crediting period for following CPA:

(a) Changes that have been notified to the secretariat and that affect the start of this monitoring period (i.e. the changed start date is the start of this monitoring period)

Reference number of the specific-case CPA	CPA-Title	Revised start date of crediting period	Date of approval from CDM EB
10484-P1-0003-CP1	SHINE – Distribution of LED Lightbulbs in India-3	06/03/2020	26/03/2020

The details of the crediting start date changes have been checked from UN webpage and UN notification mail /18/,/14/ and found correct.

E.3.2.4. Inclusion of a monitoring plan

Not Applicable

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

N/A

E.3.2.6. Changes to the project design

N/A

E.3.2.7. Changes specific to afforestation and reforestation activities

N/A

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

Means of verification	The monitoring plan as contained in respective CPA DDs/2-5/ were reviewed against the monitoring requirements of the applied methodology AMS-II.C. version 15 /06/ as well as PoA DD/01/ with reference to the technology involved. Based on this review it was found that the monitoring plan contained in the CPA DDs/2-5/ includes all the required parameters to be monitored in the context of the CPA design and description and allows proper determination of emission reductions in accordance with PoA DD/01/ and applied methodology AMS-II.C version 15/6/. The CME and CPA Implementer was interviewed by the team leader as a part of alternative means for site visit exemption to cross-check compliance of the registered monitoring plan.
Findings	No findings were raised.
Conclusion	The monitoring plan is concordant to the approved methodology AMS-II.C. version 15 /6/, that is included in each respective CPA DD/2-5/.

E.3.4. Compliance of monitoring activities with the registered monitoring plan**E.3.4.1. Data and parameters fixed ex ante or at renewal of crediting period****Combined margin emission factor for Indian, $EF_{CO_2,elec,y}$, tCO₂/MWh**

Means of verification	The value for $EF_{CO_2,elec,y}$ for Indian grid is 0.92. This is a default value of combined margin emission factor as available on the CEA website /19/. The value was also checked with the registered PoA-DD/1/ and included CPA-DDs/2-5/.
Findings	No Findings were raised.
Conclusion	The value in the monitoring report/10/ and corresponding emission reduction calculations spreadsheet/12/ are consistent with the registered PoA-DD/1/ & CPA DDs/2-5/. The applied value is correct and justified.

Rated average operating hours for LED type I, L_{i9W} , Hours

Means of verification	The average rated operating hours of 9W LED is 25,000 which was sourced from the life test reports of the LED/20/. The value of this parameter was checked with the registered PoA-DD/1/ and included CPA-DDs/2-5/.
Findings	No Findings were raised.
Conclusion	The value in the monitoring report/10/ and corresponding emission reduction calculations spreadsheet/12/ are consistent with the registered PoA-DD/1/ & CPA DDs/2-5/. The applied value is correct and justified.

Rated average operating hours for LED type I, L_{i12W} , Hours

Means of verification	The average rated operating hours of 12W LED is 25,000 which was sourced from the life test reports of the LED/20/. The value of this parameter was checked with the registered PoA-DD/1/ and included CPA-DDs/2-5/.
Findings	No Findings were raised.
Conclusion	The value in the monitoring report/10/ and corresponding emission reduction calculations spreadsheet/12/ are consistent with the registered PoA-DD/1/ & CPA DDs/2-5/. The applied value is correct and justified.

Rated average operating hours for LED type I, L_i 14W, Hours

Means of verification	The average rated operating hours of 14W LED is 25,000 which was sourced from the life test reports of the LED/20/. The value of this parameter was checked with the registered PoA-DD/1/ and included CPA-DDs/2-5/.
Findings	No Findings were raised.
Conclusion	The value in the monitoring report/10/ and corresponding emission reduction calculations spreadsheet/12/ are consistent with the registered PoA-DD/1/ & CPA DDs/2-5/. The applied value is correct and justified.

E.3.4.2. Data and parameters monitored**Number of pieces of 60W/100W baseline lamps replaced, n_i baseline (60W)/(100W, Number**

Means of verification	Criteria/Required Elements	Assessment / Observation																	
	Measuring /Reading /Recording frequency	It is monitored once at the time of project implementation.																	
	Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. The measuring and reporting frequency are in accordance to the registered PoA-DD/01/ and applied methodology/6/																	
	Monitoring equipment	Not Applicable																	
	Calibration frequency /interval:	Not Applicable																	
	Is(are) calibration(s) valid for the whole reporting period?	NA																	
	How were the values in the monitoring report verified?	<p>The parameter is monitored by collecting data using smart phones/ tablet app module and the values were verified from the CPA-database shared by CME/30/</p> <p>The value of the parameter for all the CPAs is mentioned below.</p> <p>The total no. of ICLs actually replaced were as follows:⁴</p> <table><tr><td></td><td>100 W</td><td>60 W</td></tr><tr><td>10484-P1-0001-CP1</td><td>4,906</td><td>73,204</td></tr><tr><td>10484-P1-0002-CP1</td><td>4,643</td><td>4,458</td></tr><tr><td>10484-P1-0003-CP1</td><td>44,120</td><td>26,823</td></tr><tr><td>10484-P1-0004-CP1</td><td>0</td><td>10,034</td></tr></table> <p>The total no. of ICLs considered for ER calculation were as follows:</p> <table><tr><td></td><td>100 W</td><td>60 W</td></tr></table>		100 W	60 W	10484-P1-0001-CP1	4,906	73,204	10484-P1-0002-CP1	4,643	4,458	10484-P1-0003-CP1	44,120	26,823	10484-P1-0004-CP1	0	10,034		100 W
	100 W	60 W																	
10484-P1-0001-CP1	4,906	73,204																	
10484-P1-0002-CP1	4,643	4,458																	
10484-P1-0003-CP1	44,120	26,823																	
10484-P1-0004-CP1	0	10,034																	
	100 W	60 W																	

⁴ Please refer to section E.3.1 of the report for the reason in the difference of the number of ICLs replaced/LEDs Deployed and the no. of LEDs/ICLs considered for ER calculation.

		<table><tr><td>10484-P1-0001-CP1</td><td>4,906</td><td>73,204</td></tr><tr><td>10484-P1-0002-CP1</td><td>4,642</td><td>4,457</td></tr><tr><td>10484-P1-0003-CP1</td><td>43,870</td><td>26,619</td></tr><tr><td>10484-P1-0004-CP1</td><td>0</td><td>10,034</td></tr></table>	10484-P1-0001-CP1	4,906	73,204	10484-P1-0002-CP1	4,642	4,457	10484-P1-0003-CP1	43,870	26,619	10484-P1-0004-CP1	0	10,034
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	10484-P1-0003-CP1	43,870	26,619											
	10484-P1-0004-CP1	0	10,034											
	Thus, the applied value of the parameter is correct.													
If applicable, has the reported data been cross-checked with other available data?	<p>Selected numbers of households (11 samples for each CPA i.e, 44 samples in total) were interviewed by the verification team to confirm that the end users have submitted ICL for destruction. The end users confirmed that they submitted equal number of ICLs for destruction as many as the LEDs were installed in their houses. Additionally, they confirmed the wattage of the ICLs.</p> <p>The values for each of the CPAs have also been cross-checked from the online server 'cqc.nirmalaentp.com'/52/ which has details of each household saved in the software through which the data was being collected through app using smart phones/tablet/38/. It is noteworthy that the information on the website is uneditable/incorruptible, thus the data has been checked from a credible source.</p>													
Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Yes.													
In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	No such issues.													
Findings	No finding was raised													
Conclusion	The parameter has been monitored appropriately, in accordance with the registered monitoring plan/1/ (as per measurement methods and procedures to be applied) and applied methodology/6/. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan/1/.													

Number of pieces of 60W/100W baseline lamps destroyed, n_i baseline scrapped (60W)/(100W), Number

Means of verification	Criteria/Required Elements	Assessment / Observation
	Measuring /Reading /Recording frequency	It is monitored once at the time of project implementation.
	Is measuring and reporting frequency in accordance with the	Yes. The measuring and reporting frequency are in accordance to the registered PoA-DD/01/ and applied methodology/6/

	monitoring plan and monitoring methodology? (Yes / No)																														
	Monitoring equipment	Not Applicable																													
	Calibration frequency /interval:	Not Applicable																													
	Is(are) calibration(s) valid for the whole reporting period?	NA																													
	How were the values in the monitoring report verified?	<p>The CME has provided ICL destruction certificates/42/ which confirms the number of destructed units. The certificate has been provided by a recognized organization named Auctus E-recycling solutions/42/.</p> <p>The value of the parameter for all the CPAs is mentioned below.</p> <p>The total no. of ICLs actually destroyed were as follows:⁵</p> <table border="1"> <thead> <tr> <th></th><th>100 W</th><th>60 W</th></tr> </thead> <tbody> <tr> <td>10484-P1-0001-CP1</td><td>4,906</td><td>73,204</td></tr> <tr> <td>10484-P1-0002-CP1</td><td>4,649</td><td>4,889</td></tr> <tr> <td>10484-P1-0003-CP1</td><td>44,120</td><td>26,823</td></tr> <tr> <td>10484-P1-0004-CP1</td><td>0</td><td>10,034</td></tr> </tbody> </table> <p>The total no. of ICLs considered for ER calculation were found to be:</p> <table border="1"> <thead> <tr> <th></th><th>100 W</th><th>60 W</th></tr> </thead> <tbody> <tr> <td>10484-P1-0001-CP1</td><td>4,906</td><td>73,204</td></tr> <tr> <td>10484-P1-0002-CP1</td><td>4,642</td><td>4,457</td></tr> <tr> <td>10484-P1-0003-CP1</td><td>43,870</td><td>26,619</td></tr> <tr> <td>10484-P1-0004-CP1</td><td>0</td><td>10,034</td></tr> </tbody> </table> <p>The number of units were same as the installed units for all the CPAs except for CPA 2. Please refer Appendix 4 CL#03 for details.</p> <p>Thus, the applied value of the parameter is correct.</p>		100 W	60 W	10484-P1-0001-CP1	4,906	73,204	10484-P1-0002-CP1	4,649	4,889	10484-P1-0003-CP1	44,120	26,823	10484-P1-0004-CP1	0	10,034		100 W	60 W	10484-P1-0001-CP1	4,906	73,204	10484-P1-0002-CP1	4,642	4,457	10484-P1-0003-CP1	43,870	26,619	10484-P1-0004-CP1	0
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If applicable, has the reported data been cross-checked with other available data?	<p>Selected numbers of households (11 samples for each CPA i.e, 44 samples in total) were interviewed by the verification team to confirm that the end users have submitted ICL for destruction. The end users confirmed that they submitted equal number of ICLs for destruction as many as the LEDs were installed in their houses. Additionally, they confirmed the wattage of the ICLs.</p> <p>The values for each of the CPAs have also been cross-checked from online server 'cqc.nirmalaentp.com'/52/ which has details of each household saved in the software through which the data was being collected through app</p>																														

⁵ Please refer to section E.3.1 of the report for the reason in the difference of the number of ICLs replaced/LEDs Deployed and the no. of LEDs/ICLs considered for ER calculation.

		using smart phones/tablet/38/. It is noteworthy that the information on the website in uneditable/incorruptible, thus the data has been checked from a credible source.
	Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	The number of baseline lamps scrapped were cross-checked with the number of baseline lamps scrapped mentioned in the ICL destruction certificates /42/) as per the QA/QC procedure stated in the monitoring report /10/ and were found to be different from the number of baseline lamps replaced as mentioned in the ER sheet /12/. The assessment team raised the finding(CL#03) for the same which now stands resolved.
	In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	No such issues.
Findings	CL#03 was raised and resolved.	
Conclusion	The parameter has been monitored appropriately, in accordance with the registered monitoring plan/1/ (as per measurement methods and procedures to be applied) and applied methodology/6/. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan/1/.	

Number of pieces of 9W/12W/14W project lamps distributed, n_i project (9W),(12W),(14W) Number

Means of verification	Criteria/Required Elements	Assessment / Observation
	Measuring /Reading /Recording frequency	It is monitored once at the time of project implementation.
	Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. The measuring and reporting frequency are in accordance to the registered PoA-DD/01/ and applied methodology/6/
	Monitoring equipment	Not Applicable
	Calibration frequency /interval:	Not Applicable
	Is(are) calibration(s) valid for the whole reporting period?	NA
	How were the values in the monitoring report verified?	The parameter is monitored by collecting data using smart phones/ tablet app module. The values were checked from the CPA-Database shared by CME /30/.
		The value of the parameter for all the CPAs is following: The total no. of LEDs actually distributed were as follows:

		<table border="1"> <tr> <th></th> <th>100 W</th> <th>60 W</th> </tr> <tr> <td>10484-P1-0001-CP1</td> <td>4,906</td> <td>73,204</td> </tr> <tr> <td>10484-P1-0002-CP1</td> <td>4,643</td> <td>4,458</td> </tr> <tr> <td>10484-P1-0003-CP1</td> <td>44,120</td> <td>26,823</td> </tr> <tr> <td>10484-P1-0004-CP1</td> <td>0</td> <td>10,034</td> </tr> </table> <p>The total no. of LEDs considered for ER calculation were found to be:</p> <table border="1"> <tr> <th></th> <th>100 W</th> <th>60 W</th> </tr> <tr> <td>10484-P1-0001-CP1</td> <td>4,906</td> <td>73,204</td> </tr> <tr> <td>10484-P1-0002-CP1</td> <td>4,642</td> <td>4,457</td> </tr> <tr> <td>10484-P1-0003-CP1</td> <td>43,870</td> <td>26,619</td> </tr> <tr> <td>10484-P1-0004-CP1</td> <td>0</td> <td>10,034</td> </tr> </table> <p>Thus, the applied values are correct and are consistently reported in the MR/10/ and ER sheet /12/.</p>		100 W	60 W	10484-P1-0001-CP1	4,906	73,204	10484-P1-0002-CP1	4,643	4,458	10484-P1-0003-CP1	44,120	26,823	10484-P1-0004-CP1	0	10,034		100 W	60 W	10484-P1-0001-CP1	4,906	73,204	10484-P1-0002-CP1	4,642	4,457	10484-P1-0003-CP1	43,870	26,619	10484-P1-0004-CP1	0	10,034
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10484-P1-0004-CP1	0	10,034																														
If applicable, has the reported data been cross-checked with other available data?	<p>Selected numbers of households (11 samples for each CPA i.e, 44 samples in total) were interviewed by the verification team to confirm that the identity of the end user and the total number and type of units the end users have received.</p> <p>The values for each of the CPAs have also been cross-checked from online server 'cqc.nirmalaentp.com'/52/ which has details of each household saved in the software through which the data was being collected through app using smart phones/tablet/38/. It is noteworthy that the information on the website in uneditable/incorruptible, thus the data has been checked from a credible source.</p>																															
Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Yes.																															
In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	No such issues.																															
Findings	CAR#02 was raised and resolved																															
Conclusion	The parameter has been monitored appropriately, in accordance with the registered monitoring plan/1/ (as per measurement methods and procedures to be applied) and applied methodology/6/. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan/1/.																															

Total number of 9W/12W/14W project lamps that are operational during monitoring period, n_i operational
(9W),(12W),(14W) Number

Means of verification	Criteria/Required Elements	Assessment / Observation																			
	Measuring /Reading /Recording frequency	Parameter is monitored annually.																			
	Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. The measuring and reporting frequency are in accordance with the registered PoA-DD/01/ and applied methodology/6/																			
	Monitoring equipment	Not Applicable																			
	Calibration frequency /interval:	Not Applicable																			
	Is(are) calibration(s) valid for the whole reporting period?	NA																			
	How were the values in the monitoring report verified?	<p>The parameter is calculated by using the data from the surveys.</p> <p>During the survey, following points are confirmed:</p> <ol style="list-style-type: none">1. Mark of SHINE logo on the product2. Number and type(wattage) of lamps3. Working or not working. <p>Lamps in the households having all these points are considered operational. The operational rate is multiplied by the total number of lamps of '9W/12W/14W' type to get the final value of the parameter.</p> <p>The value of the parameter for all the CPAs is following:</p> <table><tr><th></th><th>9 W</th><th>12 W</th><th>14W</th></tr><tr><td>10484-P1-0001-CP1</td><td>73,204</td><td>0</td><td>4,906</td></tr><tr><td>10484-P1-0002-CP1</td><td>4,457</td><td>0</td><td>4,642</td></tr><tr><td>10484-P1-0003-CP1</td><td>26,619</td><td>43,870</td><td>0</td></tr><tr><td>10484-P1-0004-CP1</td><td>10,034</td><td>0</td><td>0</td></tr></table> <p>The reported values were cross-checked from the CPA-Database/30/ for total number of units and monitoring survey sheet/29/ for the value operational rate shared by CME.</p> <p>Additionally, Selected numbers of households (11 samples for each CPA i.e, 44 samples in total) were interviewed by the verification team to confirm following:</p> <ul style="list-style-type: none">• The identity of the end user• The total number and type(9W/12W,14W) of units received• Whether they are working or not.		9 W	12 W	14W	10484-P1-0001-CP1	73,204	0	4,906	10484-P1-0002-CP1	4,457	0	4,642	10484-P1-0003-CP1	26,619	43,870	0	10484-P1-0004-CP1	10,034	0
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10484-P1-0004-CP1	10,034	0	0																		

		<ul style="list-style-type: none"> Does it have shine logo or not. <p>All the households reported their product being functional with the project logo on it.</p> <p>Thus, the applied value of the parameter was found to be correctly applied in the ER sheet/12/ and consistently reported in the MR/10/.</p>
	If applicable, has the reported data been cross-checked with other available data?	<p>The values have been cross verified from the monitoring survey forms /22/ which was filled at the time of surveys conducted by the third-party hired by the CME.</p> <p>The values for each of the CPAs has been cross-checked from online server 'cqc.nirmalaentp.com'/52/ which has details of each household saved in the software through which the data was being collected using smart phones/tablet/38/. /. It is noteworthy that the information on the website in non-editable/incorruptible, thus the data has been checked from a credible source.</p>
	Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Yes.
	In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	No such issues.
Findings	No finding was raised	
Conclusion	The parameter has been monitored appropriately, in accordance with the registered monitoring plan/1/ (as per measurement methods and procedures to be applied) and applied methodology/6/. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan/1/.	

Average annual operating hours of type 'i' project lamp, O_i project (9W)/(12W)/(14W)/ baseline (60W)/(100W), Hours

Means of verification	Criteria/Required Elements	Assessment / Observation
	Measuring /Reading /Recording frequency	Monitored Once prior to 1 st ex-post monitoring Survey.
	Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes /	Yes. The measuring and reporting frequency are in accordance with the registered PoA-DD/01/ and applied methodology/6/

	No)															
	Monitoring equipment	<p>Run-time meters</p> <p>General feature:</p> <ul style="list-style-type: none"> • Supports sim card • Stores data of POWER ON and POWER OFF • Device sends ON and OFF Signal with 'textlocal' with time stamp. <p>Technical Specification/47/</p> <table border="1" data-bbox="746 483 1350 992"> <tr> <td>Socket Input/ Output Voltage</td> <td>AC 110~250V</td> </tr> <tr> <td>Temperature transducer induction range</td> <td>-10°C-50°C</td> </tr> <tr> <td>Load maximum Working current</td> <td>10A</td> </tr> <tr> <td>Working current</td> <td>110~180 mA</td> </tr> <tr> <td>Working Temperature</td> <td>-20°C~ 55°C</td> </tr> <tr> <td>Storage Temperature</td> <td>-20°C~ 70°C</td> </tr> <tr> <td>Super capacitor maximum maintaining time</td> <td>15s~18s</td> </tr> </table>	Socket Input/ Output Voltage	AC 110~250V	Temperature transducer induction range	-10°C-50°C	Load maximum Working current	10A	Working current	110~180 mA	Working Temperature	-20°C~ 55°C	Storage Temperature	-20°C~ 70°C	Super capacitor maximum maintaining time	15s~18s
Socket Input/ Output Voltage	AC 110~250V															
Temperature transducer induction range	-10°C-50°C															
Load maximum Working current	10A															
Working current	110~180 mA															
Working Temperature	-20°C~ 55°C															
Storage Temperature	-20°C~ 70°C															
Super capacitor maximum maintaining time	15s~18s															
	Calibration frequency /interval:	Calibration is not required as confirmed from the declaration of manufacturer shared by the CME /40/														
	Is(are) calibration(s) valid for the whole reporting period?	NA														
	How were the values in the monitoring report verified?	<p>The CME has monitored the parameter through surveys. The CME collected DISCOM data from the electricity board. This data formed the population to withdraw the samples. The randomly picked samples were the houses where the run meters were installed to measure the average operating hours for a minimum period of 90 days.</p> <p>These run meters continuously measured the operating hours. The run-time meters store the data along with the time stamp due to the GSM sim card.</p> <p>The applied methodology does prescribe limit the monitoring to be done in any specific period. It only requires a continuous monitoring for 90 days. Thus, the CME had done the monitoring in a way that only 90days continuous data collection was considered as a condition to be followed, because of which most of datapoints are concentrated from November to December for CPA1, from August to September for CPA2, from September to October for CPA3, and from December to January for CPA4. The concentrated data points do not fall under any non-compliance of the applied methodology. However, there is one conditions which the applied methodology mentions 'to apply a correction factor to account for seasonal variation' which the CME had missed earlier and has determined and applied it now.</p> <p>The CME has calculated correction factor by applying following formula:</p>														

	<p>CF=(DHseason-DHy)/(DHy)</p> <p>CF – correction factor DHseason – Average daylight hours excluding daylight hours of corresponding months for that season DHy – Average daylight hours for the year</p> <p>The above formula is general mathematical expression for decrease factor as compared to original since the applied methodology does not have any formula for correction factor mentioned in it.</p> <p>The CME calculated the average hours of darkness which would decide the operating hours of the LED bulbs for the entire year. Then, calculated average of darkness hours (or hours of operation) without considering certain months. These months are January and February for winter, March, April and May for summer, June, July August September for South West Monsoon and October, November, December for North East Monsoon. The classification of weather is as per the data published on government website(https://knowindia.gov.in/profile/climate.php). The average hours excluding these months help in determining correction factor for that particular season by applying the formula stated above. For example, average of operating hours with Jan and Feb are used in the above stated formula to get a correction factor -0.021 for the winter months(see cell E41, tab 'Project Correction Factor', worksheet titled 'Discount factor calculation'). The CME has calculated correction factor in similar way for each season. The factor has been calculated for representative states too. The highest factor of all was found to be 0.050 which is for the monsoon months in Delhi. The CME has applied this (the highest value) as correction factor to all the measured values of operating hours and calculated the final value of the parameter and used in the final ER calculation. The value of the parameter and the final achieved ERs have reduced for all the CPAs after applying this factor.</p> <p>The application of correction factor is prescribed by methodology (para 22, page 8) and the registered monitoring plan (page 22 of the PoA DD). Thus, it's calculation and application were found to comply with both.</p> <p>The monitoring result were presented in excel sheet 'data analysis sheets' (for each CPA type)/32/. These sheets have numbers of operating minutes (which was divided by 60 minutes to convert the operating minutes into hours) for recorded on each day. The CME has collected 90days data for selected number of samples and calculated an average value of the parameter for each CPA. While calculating the average value, the CME has not considered the meters which collected data for less than 90 days or the meters which gave abysmally high values.</p> <p>The sheets with monitoring results had only device number and SIM number written in it. Therefore, the CME has provided another sheet with details of the sampled households/43/.</p> <p>To verify the values in the data analysis sheet, the</p>
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		<p>verification team checked the online server 'sandpuppy'/50/. The information in server cannot be tampered and was found to be consistent with the values presented in the data analysis sheets/32/.</p> <p>Additionally, the verification team has conducted acceptance sampling on CME's sampling. Selected numbers of households (11 samples for each CPA i.e, 44 samples in total) were interviewed by the verification team to confirm following:</p> <ul style="list-style-type: none"> • The identity of the HH with run-time meter • Monitoring details (90 days) • Lamp identification whether for LED/ICL <p>The value of the parameter for each of the CPAs is as following:</p> <table border="1" data-bbox="742 683 1428 869"> <thead> <tr> <th></th> <th>10484-P1-0001-CP1</th> <th>10484-P1-0002-CP1</th> <th>10484-P1-0003-CP1</th> <th>10484-P1-0004-CP1</th> </tr> </thead> <tbody> <tr> <td>Operating Hours</td> <td>2,186.35</td> <td>2,347.0</td> <td>2,153.5</td> <td>2,248.4</td> </tr> </tbody> </table> <p>Per day operating hours is obtained from the data stored which is</p> <p>5.99 hours for CPA-1</p> <p>6.43 hours for CPA-2</p> <p>5.9 hours for CPA-3</p> <p>6.16 hours for CPA-4.</p> <p>Annual average =</p> <p>$5.99 \times 365 = 2,186.35$ hours</p> <p>$6.43 \times 365 = 2,347.0$ hours</p> <p>$5.9 \times 365 = 2,153.5$ hours</p> <p>$6.16 \times 365 = 2,248.4$ hours</p> <p>The calculation in the ER sheet /12/ and the Data analysis sheet /13/ was conducted in-line to the PoA-DD/1/ and CPA-DDs/2-5/.</p> <p>The value of the parameter was found consistently reported in the MR/10/.</p>		10484-P1-0001-CP1	10484-P1-0002-CP1	10484-P1-0003-CP1	10484-P1-0004-CP1	Operating Hours	2,186.35	2,347.0	2,153.5	2,248.4
	10484-P1-0001-CP1	10484-P1-0002-CP1	10484-P1-0003-CP1	10484-P1-0004-CP1								
Operating Hours	2,186.35	2,347.0	2,153.5	2,248.4								
	If applicable, has the reported data been cross-checked with other available data?	The data in the meter location sheets have checked through acceptance sampling and the data of run time meter sheets have been checked from online server 'sandpuppy'/50/ where the meter recordings are noted directly.										
	Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Not Applicable										

	In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	No such issues.
Findings	CL#02,CL#04,CL#05,CL#06 ,CAR#04 and CAR#05 were raised and resolved.	
Conclusion	The parameter has been monitored appropriately, in accordance with the registered monitoring plan/1/ (as per measurement methods and procedures to be applied) and applied methodology/6/. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan/1/.	

Rated power of 60 W & 100 W baseline lamps replaced, ρ_i baseline 60W, 100 W, Watts

Means of verification	Criteria/Required Elements	Assessment / Observation
	Measuring /Reading /Recording frequency	Monitored Once at the time of project installation
	Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. The measuring and reporting frequency are in accordance with the registered PoA-DD/01/ and applied methodology/6/
	Monitoring equipment	NA
	Calibration frequency /interval:	Not Applicable
	Is(are) calibration(s) valid for the whole reporting period?	NA
	How were the values in the monitoring report verified?	The values have been verified from the recorded database/30/ and photos of the nameplates with the rated power/24/.
	If applicable, has the reported data been cross-checked with other available data?	<p>Selected numbers of households (11 samples for each CPA i.e, 44 samples in total) were interviewed by the verification team to confirm that the end users have submitted ICL for destruction. The end users confirmed that they submitted equal number of ICLs for destruction as many as the LEDs were installed in their houses. Additionally, they confirmed the wattage of the ICLs.</p> <p>The values for each of the CPAs have also been cross-checked from online server 'cqc.nirmalaentp.com'/52/ which has details of each household saved in the software through which the data was being collected though app using smart phones/tablet/38/.</p>

	Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Not Applicable
	In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	No such issues.
Findings	No finding was raised	
Conclusion	The parameter has been monitored appropriately, in accordance with the registered monitoring plan/1/ (as per measurement methods and procedures to be applied) and applied methodology/6/. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan/1/.	

Rated power of the LEDs of 9W, 12W & 14W project lamps, P_i project lamps 9W, 12 W, 14W Watts

Means of verification	Criteria/Required Elements	Assessment / Observation				
	Measuring /Reading /Recording frequency	Monitored Once at the time of project installation				
	Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. The measuring and reporting frequency are in accordance with the registered PoA-DD/01/ and applied methodology/6/				
	Monitoring equipment	NA				
	Calibration frequency /interval:	Not Applicable				
	Is(are) calibration(s) valid for the whole reporting period?	NA				
	How were the values in the monitoring report verified?	The values have been verified from the recorded database/30/ and photos of the nameplates with the rated power/24/.				
		The rated power of the project lamps distributed under each of the CPAs were as follows:				
			10484-P1-0001-CP1	10484-P1-0002-CP1	10484-P1-0003-CP1	10484-P1-0004-CP1
	Rated Power of	9 W and 14 W	9 W and 14 W	9 W and 12 W	9 W	

		<table border="1"> <tr> <td>installed LEDs</td> <td></td> <td></td> <td></td> <td></td> </tr> </table> <p>The rated power was verified during the remote survey through the interview of the sampled HH/25/.</p>	installed LEDs				
	installed LEDs						
	If applicable, has the reported data been cross-checked with other available data?	<p>Selected numbers of households (11 samples for each CPA i.e, 44 samples in total) were interviewed by the verification team to confirm that the identity of the end user and the total number and wattage of units the end users have received.</p> <p>The values for each of the CPAs have also been cross-checked from online server 'cqc.nirmalaentp.com'/52/ which has details of each household saved in the software through which the data was being collected through app using smart phones/tablet/38/.</p>					
	Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Not Applicable					
In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	No such issues.						
Findings	No finding was raised						
Conclusion	The parameter has been monitored appropriately, in accordance with the registered monitoring plan/1/ (as per measurement methods and procedures to be applied) and applied methodology/6/. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan/1/.						

Average annual technical grid losses, L_y , %

Means of verification	Criteria/Required Elements	Assessment / Observation
	Measuring /Reading /Recording frequency	This value is fixed for the entire crediting period and was determined at CPA level.
	Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. The measuring and reporting frequency are in accordance with the registered PoA-DD/01/ and CPA-DDs/2-5/
	Monitoring equipment	NA
	Calibration frequency	Not Applicable

	/interval:	
	Is(are) calibration(s) valid for the whole reporting period?	NA
	How were the values in the monitoring report verified?	The value applied is a default value sourced from the applied methodology AMS.II.C Version 15.0 /6/ The default value is 10%
	If applicable, has the reported data been cross-checked with other available data?	NA
	Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	NA
	In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	No such issues.
Findings	No finding was raised	
Conclusion	The parameter has been monitored appropriately, in accordance with the registered monitoring plan/1/ (as per measurement methods and procedures to be applied) and applied methodology/6/. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan/1/.	

E.3.4.3. Implementation of sampling plan

Means of verification	<p>The assessment of CME's sampling is discussed below: The CME has applied separate sampling plan for all the 4 CPAs. According to Sampling and Survey standards,' version 8.0/26/, the sampling plan applied by the PP for the following CPAs are found to be appropriate. As per the sampling plan stated in the PoA DD/1/, a minimum 95% confidence interval and a 10% margin of error requirement is achieved for the sampled parameters. The revised PoA DD/1/ consistently mentions annual monitoring, the actual monitoring also has also been conducted annually.</p> <p>Target Population- All the end users receiving the LED bulbs for n_i operational and for parameter 'o_i project' database was provided respective by DISCOM under each CPA.</p> <p>Sample Frame- The sample frame is developed from the respective state utility customer account records for each CPA</p> <p>Sampling Method and selection- The method used in sampling was Simple random sampling in order to determine the sample size for monitoring the parameters. The LEDs were selected randomly for each CPA as checked from the screenshots of the random generator online website Stat Trek/39/.</p> <p>There is only one country to be sampled, there is only one type of project lamp with</p>
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different wattages (9W,12W & 14W).

Sample Size for Parameter of Interest:

The sampling has been applied to the following monitoring parameters

- $O_{i \text{ project}}$ (Operating hours of replaced ICL lamps or installed LEDs using run time meters)
- $n_{i \text{ operational}}$ (Number of operational project lamps during the monitoring period)

The sample size for parameter ' $n_{i \text{ operational}}$ ' was chosen using the equation inline to CDM guidelines for Sampling and surveys for CDM project activities and programmes of activities/27/.

For the parameter ' $O_{i \text{ project}}$ ' which is a mean parameter, CME had applied equation for proportion parameter as stated in the CDM guidelines for Sampling and surveys for CDM project activities and programmes of activities/27/, which is incorrect as the ' $O_{i \text{ project}}$ ' is a mean parameter. The issue was identified (please refer to CL#04) and CME then demonstrated in the data analysis sheet that even after applying the correct formula the number of samples checked were more than the minimum sample size and the reliability has been met.

In this regard, sample size calculation spreadsheet /28/ was checked and found correct as per registered monitoring plan. The complete details are given in E.3 section of Monitoring Report/10/.

Implementation of Sampling Survey and Field Survey Records:

Based on interviews with the CME and the videos and pictures of the sampled HHs and surveyors during the remote survey, in addition to simply asking this question to the end users surveyors were also checking whether it was operational or not. Therefore, the implementation of surveys was considered reliable. The surveyors also took photos of distributed LED Bulbs which were checked during the desk review by the assessment team.

Monitoring survey (by CME) duration:

The monitoring survey (field survey / tests) was carried out by independent third party hired by CME/21/ between following duration for the current monitoring period.

CPA Ref.No.	Technology	From	To
10484-P1-0001-CP1	LED Bulb	11/03/2020	16/03/2020
10484-P1-0002-CP1	LED Bulb	17/03/2020	20/03/2020
10484-P1-0003-CP1	LED Bulb	17/03/2020	19/03/2020
10484-P1-0004-CP1	LED Bulb	03/03/2020	05/03/2020

For operating Hours:

CPA Ref.No.	Technology	From	To
10484-P1-0001-CP1	Run-time meters installed in the baseline lamp	16/08/2018	14/04/2019
10484-P1-0002-CP1	Run-time meters installed in the baseline lamp	30/06/2019	07/01/2020
10484-P1-0003-CP1	Run-time meters installed in the baseline lamp	16/06/2019	12/02/2020
10484-P1-0004-CP1,	Run-time meters installed in the baseline lamp	04/10/2018	31/05/2019

Reliability and precision calculation:

	<p>The verification team has verified the Monitored survey results /29/ with the monitored data, where the actual achieved precision is calculated against the Guidelines outlined under “Standard for sampling and surveys for CDM project activities and Programme of Activities” /27/ and confirms that the calculation of achieved reliability was done correctly.</p> <p>All parameters of interest are included in the ER spreadsheet/12/ for the CPAs under consideration. These were checked for the input values as well as formula applied and were found consistent. The reliability (demonstration of precision achieved after the survey results) is depicted in the Monitoring survey sheet/29/ corresponding to final Monitoring Report /10/, which were also found correct.</p> <p>Thus, the verification team confirms that required precision has been met and the results are reliable.</p>
Findings	CAR#01 and CL#04 was raised and resolved
Conclusion	The verification team confirmed that the sampling plan and the parameter values are in accordance with the monitoring plan provided in PoA DD /1/.

E.3.5. Compliance with the calibration frequency requirements for measuring instruments

Means of verification	There are no calibration requirements for the monitoring equipment stated in the PoA-DD /1/ and CPA-DDs/2-5/.
Findings	CL#04 was raised and resolved
Conclusion	The verification team confirm that CME applied good practices (as per manufacturer recommendation) while using the monitoring equipment and these were under the state of calibration. There is no specific requirement prescribed in this regard in the registered monitoring plan/1/ and in monitoring methodology/6/. Therefore, the approach presented by PP was accepted.

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

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

Means of verification	<p>Baseline emissions have been calculated in-line with the methodology/10/ which is as follows:</p> $BE_y = E_{BL,y} \times EF_{CO2,ELEC,y} + Q_{ref,BL} \times GWP_{ref,BL}$ <p>As the project aims at distributing LEDs by replacing ICLs, thus no refrigerant is involved so the equation is modified as:</p> $BE_y = E_{BL,y} \times EF_{CO2,ELEC,y}$ <p>Where:</p> <table border="1"> <tr> <td>BE_y</td><td>Baseline emissions in year y (tCO₂e)</td></tr> <tr> <td>$E_{BL,y}$</td><td>Energy consumption for the baseline (ICLs) in year y (kWh)</td></tr> <tr> <td>$EF_{CO2,ELEC,y}$</td><td>Electricity emissions factor.</td></tr> </table> <p>Energy consumption for baseline in year y is calculated as:</p> $E_{BL,y} = 0.95 \times \sum_i (n_i \times \rho_i \times o_i / (1 - l_y))$ <table border="1"> <tr> <td>n_i</td><td>Number of pieces of equipment of the group of ‘i’ baseline equipment (ICLs) replaced.</td></tr> <tr> <td>ρ_i</td><td>Electrical power demand (kW) of the group of ‘i’ baseline equipment (e.g. 60W or 100W incandescent lamps). In the case of more than one type of ICLs are replaced, electrical power demand is the weighted average of the rated power (kW) of group i baseline equipment (ICLs).</td></tr> <tr> <td>o_i</td><td>Average annual operating hours of the group of ‘i’ baseline equipment (ICLs).</td></tr> </table>	BE_y	Baseline emissions in year y (tCO ₂ e)	$E_{BL,y}$	Energy consumption for the baseline (ICLs) in year y (kWh)	$EF_{CO2,ELEC,y}$	Electricity emissions factor.	n_i	Number of pieces of equipment of the group of ‘i’ baseline equipment (ICLs) replaced.	ρ_i	Electrical power demand (kW) of the group of ‘i’ baseline equipment (e.g. 60W or 100W incandescent lamps). In the case of more than one type of ICLs are replaced, electrical power demand is the weighted average of the rated power (kW) of group i baseline equipment (ICLs).	o_i	Average annual operating hours of the group of ‘i’ baseline equipment (ICLs).
BE_y	Baseline emissions in year y (tCO ₂ e)												
$E_{BL,y}$	Energy consumption for the baseline (ICLs) in year y (kWh)												
$EF_{CO2,ELEC,y}$	Electricity emissions factor.												
n_i	Number of pieces of equipment of the group of ‘i’ baseline equipment (ICLs) replaced.												
ρ_i	Electrical power demand (kW) of the group of ‘i’ baseline equipment (e.g. 60W or 100W incandescent lamps). In the case of more than one type of ICLs are replaced, electrical power demand is the weighted average of the rated power (kW) of group i baseline equipment (ICLs).												
o_i	Average annual operating hours of the group of ‘i’ baseline equipment (ICLs).												

	l_y	0.10
	0.95	Net to gross adjustment factor
	The values of the parameters listed above have been verified under section E.6.1 and E.6.2. Equation was found to be correctly applied in the ER sheet /12/.	
Findings	No findings were raised.	
Conclusion	<p>The verification team confirms that</p> <ul style="list-style-type: none"> a) The complete data was available and is duly reported; b) As indicated above, the description with regard to cross-check of reported data is included under respective parameter above; c) Appropriate methods and formulae for calculating baseline GHG emissions or baseline net GHG removals were followed; d) Appropriate emission factors, IPCC default factors and other reference values were correctly applied. e) There is no pro-rata approach applied in the current monitoring period as entire monitoring period falls into period that is after the end of first commitment period of Kyoto Protocol. 	

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

Means of verification	Project emissions for the project activity was found to be calculated in-line with the applied methodology /6/ which was as follows: $PE_y = E_{PE,y} \times EF_{CO2,ELEC,y} + PE_{ref,y}$	
	PE_y	Project emissions in year y (tco2e)
	$EP_{PJ,y}$	Energy consumption in project activity in year y. This shall be determined ex post based on monitored values
	$EF_{CO2,y}$	Emission factor for electricity or thermal baseline energy. The emissions associated with grid electricity consumption should be calculated in accordance with the procedures of AMS-I.D. For fossil fuel displaced reliable local or national data for the emission factor shall be used; IPCC default values should be used only when country or project-specific data are not available or difficult to obtain
	$PE_{ref,y}$	Project emissions from physical leakage of refrigerant from the project equipment in year y (tco2e/y)
	As the project involves the distribution of LEDs by the replacement of ICLs hence no refrigerant is involved. Thus, the equation followed for project emissions as follows: $PE_y = E_{PE,y} \times EF_{CO2,ELEC,y}$	
	n_i	Number of groups 'i' project devices operating during time interval t in year y.
	ρ_i	Electrical power demand (kW) of the group 'i' project devices measured during the time interval t in year y.
	o_i	Operating hours of group of 'i' project devices in the time interval t in year y
	0.95	Net to gross adjustment factor
	The value of the parameter listed above have been verified under section E.6.1 and E.6.2. Equation was found to be correctly applied in the ER sheet /12/.	
Findings	No findings were raised	
Conclusion	The verification team confirms that	

	<p>(a) The monitored data was available in accordance with the registered monitoring plan;</p> <p>(b) The monthly reported data was cross-checked, as prescribed in the revised approved PDD/01/, with the relevant supporting and was found consistent;</p> <p>(c) Appropriate methods and formulae for calculating project emissions or baseline net GHG removals have been followed;</p> <p>(d) The assumptions, emission factors and default values that were applied in the calculations have been justified;</p> <p>(f) The first day on which CERs are being claimed has been correctly specified, where applicable.</p>
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E.3.6.3. Calculation of leakage GHG emissions

Means of verification	The PoA DD/01/, CPA DDs/2-5/ and applied monitoring methodology/6/ prescribes leakage consideration only if the energy efficient technology involves equipment transferred from another activity. However, LEDs to be installed at the HHs are not transferred from any other activity. Thus, leakage emissions are not applicable. However, the leakage adjustment factor that is required to adjust the baseline emissions has been duly accounted in emission reduction calculations.
Findings	No findings raised.
Conclusion	No additional leakage emissions (other than what is already considered in baseline calculations) were required in accordance with the methodology AMS-II C, version 15/6/ as the LEDs installed were not transferred from another project activity.

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

Means of verification	<p>The following equations were used to determine the Emission reduction as provided in the monitoring report/10/ and applied in the corresponding ER calculations sheets/12/. The expressions used were found consistent with the registered PoA DD/01/, CPA DDs/2-5/ and the applied methodology AMS-II.C, version 15/6/:</p> <p>Total ER reductions achieved in the current monitoring period by the LED bulbs distributed in the relevant CPA is calculated using the following expressions:</p> <p>Emission reductions are calculated as follows:</p> $ER_y = (BE_y - PE_y) - LE_y$ <p>Where:</p> <table border="1"> <tr> <td>ER_y</td><td>emission reductions, t CO₂e,</td></tr> <tr> <td>BE_y</td><td>Baseline Emissions</td></tr> <tr> <td>PE_y</td><td>Project Emissions</td></tr> <tr> <td>LE_y</td><td>Leakage Emissions</td></tr> </table> <p>$ER_y = 2,485 - 364 - 0 = 2,121 \text{ tCO}_2\text{e}$</p> <p>The final value of Emission reduction is 2,121 tCO₂e</p> <p>Emission reduction from the project activity were based on baseline, project emissions only. The calculations presented in this regard in the final monitoring report /10/ and corresponding ER calculation sheet /12/were found appropriate and complying with provisions prescribed in the registered monitoring plan /01/ and applied methodology /6/</p> <p>The verification team confirms that an audit trail that contains the evidence and records that validated the stated figures were checked and found acceptable.</p>	ER_y	emission reductions, t CO ₂ e,	BE_y	Baseline Emissions	PE_y	Project Emissions	LE_y	Leakage Emissions
ER_y	emission reductions, t CO ₂ e,								
BE_y	Baseline Emissions								
PE_y	Project Emissions								
LE_y	Leakage Emissions								
Findings	No findings were raised								
Conclusion	<p>The verification team confirms that:</p> <p>a) The complete data was available and is duly reported.</p> <p>b) As indicated above, the description with regard to cross-check of reported data is included under respective parameter (refer Section E.3.4.2 of this report);</p> <p>c) Appropriate methods and formulae for calculating baseline GHG emissions or baseline net GHG removals, project emissions and leakage emissions were followed;</p>								

	<p>d) Appropriate emission factors, IPCC default factors and other reference values were correctly applied.</p> <p>e) There is no pro-rata approach was applied in the current monitoring period as entire monitoring period falls into period that is after the end of first commitment period of Kyoto Protocol.</p> <p>The total number of ERs achieved during the current monitoring period is 2,121 tCO₂e.</p>
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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
SHINE – Distribution of LED Lightbulbs in India-1, 10484-P1-0001-CP1	1,817	270	0	0	1,547	1,547
SHINE – Distribution of LED Lightbulbs in India-2, 10484-P1-0002-CP1	292	42	0	0	250	250
SHINE – Distribution of LED Lightbulbs in India-3, 10484-P1-0003-CP1	146	18	0	0	128	128
SHINE – Distribution of LED Lightbulbs in India-4, 10484-P1-0004-CP1	230	34	0	0	196	196
Total	2,485	364	0	0	2,121	2,121

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

Means of verification	<p>As verified and evident from the final Monitoring Report/10/ and corresponding ER calculations sheet/12/, the actual emission reductions achieved by CPAs is included in the current monitoring period were more than estimated for 1 CPA (10484-P1-0002-CP1) and less than the estimated quantity for rest 3 CPAs, The estimated ERs were checked with the respective CPA DDs/2-5/.</p> <p>Also, the total emission reduction achieved during the monitoring period is less than the estimated emission reduction for the same period.</p> <p>The actual emission reductions achieved for CPA (for CPA 2 (10484-P1-0002-CP1)) in monitoring period is more than the estimated quantity of ERs for the same period due to the slightly higher monitored operating hours (i.e.6.43 hours/day</p>
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	respectively) as compared to the operating hours considered at the time of ex-ante calculation (i.e.5 hours/day). Accordingly, it was accepted by the verification team. The assessment team has checked the details regarding the operating hours and found it correct.
Findings	No finding was raised.
Conclusion	The actual emission reductions achieved in monitoring period is more than the estimated quantity of ERs only for CPA-2 due to higher operating hours per day as compared to the operating hours considered for ex-ante calculation and less than for the remaining 3 CPAs. The justification provided by the CME was found to be sufficient and thus it was accepted by the verification team.

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)
SHINE – Distribution of LED Lightbulbs in India-1, 10484-P1-0001-CP1	1,547	1,663
SHINE – Distribution of LED Lightbulbs in India-2, 10484-P1-0002-CP1	250	207
SHINE – Distribution of LED Lightbulbs in India-3, 10484-P1-0003-CP1	128	251
SHINE – Distribution of LED Lightbulbs in India-4, 10484-P1-0004-CP1	196	217
Total	2,121	2,338

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

Means of verification	As verified and evident from the final Monitoring Report/10/ and corresponding ER calculations sheet/12/, the actual emission reductions achieved by CPAs is included in the current monitoring period were more than estimated for 1 CPA (i.e. for 10484-P1-0002-CP1) and less than the estimated quantity for rest 3 CPAs, The estimated ERs were checked with the respective CPA DDs/2-5/ for the comparable period for the higher monitored operating hours. The actual emission reductions achieved in monitoring period for all the CPAs is less than the estimated quantity of ERs for the same period. Accordingly, it was accepted by the verification team.
Findings	No findings raised.
Conclusion	The actual emission reduction is less than the estimated ERs for the monitoring period. The justification provided by the CME was found to be sufficient and thus it was accepted by the verification team

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

Means of verification	This section was not applicable as no such document was found to be developed and published on the UNFCCC CDM website by the CME. Thus, in-line to para 361(a) of the VVS for PoA Version 2.0 /7/ PP had not monitored the sustainable development co-benefits.
Findings	No findings were raised
Conclusion	Not applicable as it was not monitored by the PP.

E.3.8. Global stakeholder consultation

Means of verification	The monitoring report for the current monitoring period was published on 03/04/2020 for comment period 06/04/2020- 20/04/2020.
Findings	No findings were raised
Conclusion	No comments were received during the comment period as checked from the UNFCCC project webpage/14/.

SECTION F. Internal quality control

A draft verification report prepared by verification team is reviewed by an independent technical review team (one or more members) to confirm whether all the internal procedures established and implemented by ESPL were duly complied with and such opinion/conclusion was reached in an objective manner that complies with the applicable CDM rules/requirements. The technical review team is collectively required to possess the technical expertise of all the technical area/sectoral scope the project activity relates to. All team members of technical review team are independent of the verification team.

During the technical review process additional findings may be identified or the closed-out findings may be opened, which needs to be satisfactorily resolved before the request for issuance is submitted to UNFCCC. The independent technical reviewer may either approve the report as such or reject/return the same in such case providing the comments/findings/issues that needs to be resolved by the verification team. The decision taken by the Technical Reviewer is final and is authorized by the Managing Director on behalf of Earthood Services Private Limited.

SECTION G. Verification opinion

Earthood Services Private Limited (ESPL), contracted by Brightspark Energy Pvt Ltd. (the CME for the PoA), has performed the first independent verification of the emission reductions for the registered CDM PoA 10484 "SHINE-Distribution of LED Light Bulbs in India" for the monitoring period 12/01/2020-15/03/2020(both days included) as reported in the Monitoring Report (final) Version 3 dated 05/10/2020. The CME is responsible for the collection of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the project activity.

This verification report is for the CPAs (10484-P1-0001-CP1, 10484- P1-0002-CP1, 10484- P1-0003-CP1, 10484- P1-0004-CP1) which were included at the UNFCCC webpage at the end of the current monitoring period. A single monitoring report has been prepared by the CME for the same in which implementation of all referred CPAs along with monitoring results is included.

ESPL confirms that the monitoring system is in place and the emission reductions are calculated without material misstatements. This verification report has been prepared using the latest available template specified by UNFCCC and complies with the instructions to follow as per CDM VVS for PoA Version 2.

The verification activities were conducted in accordance with ESPL's CDM Quality Manual System. The verification process has resulted in conclusion that the included CPAs confirm to the registered PoA DD as well as comply with applicable CDM rules and regulations and in accordance with applied monitoring methodology, AMS II.C Version 15.

As a result, it is confirmed that the emission reductions from the CDM PoA 10484 "SHINE-Distribution of LED Light Bulbs in India" are correctly reported in the Monitoring Report (final) Version 3 dated 05/10/2020 and corresponding ER sheets for the monitoring period 12/01/2020-15/03/2020 (including both days) amount as 2,121 tCO₂e. Therefore, this will be submitted as part of a request for issuance as per CDM PCP for PoA, Version 2.

SECTION H. Certification statement

Earthood Services Private Limited (ESPL), contracted by Brightspark Energy Pvt Ltd. (the CME for the PoA), has performed the first independent verification of the emission reductions for the registered CDM PoA 10484 "SHINE-Distribution of LED Light Bulbs in India" for the monitoring period 12/01/2020-15/03/2020 (both days included) as reported in the Monitoring Report Version 3 dated 05/10/2020/10/.

The verification is based on the registered PoA-DD/1/, CPA-DDs/2-5/ and the monitoring report for this project. Our verification approach was based on the requirements as defined under the Kyoto Protocol, Marrakech accord, as well as those defined by the CDM Executive Board.

The management of the Brightspark Energy Pvt Ltd is responsible for the preparation of the GHG emissions data and the reported GHG emissions reductions on the basis set out within the project Final Monitoring Report Version 3 dated 05/10/2020/10/. The development and maintenance of records and reporting procedures are in accordance with the Monitoring Report Version 3 dated 05/10/2020/10/.

It is our responsibility to express an independent GHG verification opinion on the GHG emissions and on the calculation of GHG emission reductions from the project for the monitoring period 12/01/2020 up to 15/03/2020 (including both dates) based on the reported emission reductions in the Final Monitoring Report Version 3 dated 05/10/2020/10/ for the same period.

Based on an understanding of the risks associated with reporting GHG emissions data and the controls in place to mitigate these, ESPL planned and performed our work to obtain the information and explanations that we considered necessary to provide sufficient evidence for us to give reasonable assurance that this reported amount of GHG emission reductions for the period is fairly stated.

ESPL confirms the following:

Reporting period: From 12/01/2020 up to 15/03/2020 (including both dates)

Verified and certified emission in the above reporting period:

	Amount	Unit
Certified emission reductions (CERs)	2,121	tCO ₂ e

Appendix 1. Abbreviations

Abbreviations	Full texts
AQL	Acceptable Quality Level
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM PCP	Clean Development Mechanism Project Cycle Procedure
CDM PS	Clean Development Mechanism Project Standard
CDM VVS	Clean Development Mechanism Validation and Verification Standard
CER	Certified Emission Reduction
CL	Clarification Request
CME	Coordinating or Managing Entity
CPA	Component Project Activity
CP	Crediting period
DISCOM	Power Distribution Company
DOE	Designated Operational Entity
DNA	Designated National Authority
EB	Executive Board
ESPL	Earthood Services Private Limited
FAR	Forward action request
GHG	Green House Gases
ICL	Incandescent Light
IPCC	Intergovernmental Panel on Climate change
LED	Light Emitting Diode
MIS	Management Information System
POA	Programme Of Activity
PO	Partner Organization
PSU	Primary Sampling Unit.
TA	Technical Area
TR	Technical Reviewer
VVS	Validation and Verification Standard
UNFCCC	United Nation Framework convention on Climate change

Appendix 2. Competence of team members and technical reviewers

Competence Statement	
Name	Deepika Mahala
Country	India
Education	M. Sc. (Environmental Management), GGSIP University B.Sc. Hons. (Chemistry), Sri Venkateshwar College, DU
Experience	3 Years +
Field	Climate Change
Approved Roles	
Team Leader	YES
Validator	YES
Verifier	YES
Methodology Expert	ACM0002, AMS.I.D., AMS.I.A, AMS.III.AV, AMS.II.G
Local expert	YES (India)
Financial Expert	NO
Technical Reviewer	YES

TA Expert	YES (TA 1.2 & TA 3.1)		
Reviewed by	Shreya Garg	Date	14/09/2018
Approved by	Anshika Gupta	Date	14/09/2018

Competence Statement			
Name	Sanjeev Kumar		
Country	India		
Education	B. Tech. (Chemical Engineering) M.Tech. (Energy Management)		
Experience	13.5 years +		
Field	Climate Change, Environment, Energy		
Approved Roles			
Team Leader	YES		
Validator	YES		
Verifier	YES		
Methodology Expert	YES (ACM0002, ACM0006, ACM0004, ACM0009, ACM0012, ACM0001, AMS I.D, AMS I.F, AMS I.C, AMS I.A, AMS II.C, AMS II.D, AMS II.E, AMS III.H, AM0009, AM0013, AM0025, AM0056, AM0028, AM0029, AM0008, AMS III.R, ACM0003)		
Local expert	YES (India)		
Financial Expert	NO		
Technical Reviewer	YES		
TA Expert	YES (TA 1.1, TA 1.2, 4.1, 13.1)		
Reviewed by	Shreya Garg	Date	16/01/2020
Approved by	Anshika Gupta	Date	16/01/2020

Competence Statement			
Name	Vaishali Vatsa		
Education	M.Sc. (Environmental Studies and Resource Management), TERI University		
Experience	4 months		
Field	Climate Change		
Approved Roles			
Team Leader	NO		
Validator	Yes		
Verifier	Yes		
Methodology Expert	NO		
Local expert	NO		
Financial Expert	NO		
Technical Reviewer	NO		
TA Expert (X.X)	NO		
Trainee	NO		
Reviewed by	Shreya Garg	Date	30/12/2019
Approved by	Anshika Gupta	Date	02/01/2020

Competence Statement			
Name	Rahi Sahni		
Education	M.Sc Environment Science and Technology, Bharati Vidyapeeth University, Pune		
Experience	6 months		
Field	Climate Change and Environment		
Approved Roles			
Team Leader	NO		
Validator	Yes		
Verifier	Yes		
Methodology Expert	NO		
Local expert	NO		
Financial Expert	NO		
Technical Reviewer	NO		
TA Expert	NO		
Reviewed by	Shreya Garg	Date	09/04/2020
Approved by	Anshika Gupta	Date	09/04/2020

Competence Statement			
Name	Ashok Gautam		
Country	India		
Education	M. Sc. (Environmental Sciences) M. Tech. (Energy & Environmental Management)		
Experience	16 Years +		
Field	Energy, Climate Change & Environment		
Approved Roles			
Team Leader	YES		
Validator	YES		
Verifier	YES		
Methodology Expert	AMS-I.D., AMS-I.A., AMS-I.C., AMS-I.E, AMS-II.D., AMS-II.G., AMS-III.E., AMS-III.H., AMS-III.Q, AMS-III.Z., AMS-III.AV., AM0029, AM0025, AM0056, ACM0001, ACM0002, ACM0004, ACM0012, ACM0006, AM0018, ACM0009, AM0034, AMS.I.B, ACM0003		
Local expert	YES (India)		
Financial Expert	YES		
Technical Reviewer	YES		
TA Expert	YES (TA 1.1, TA 1.2, TA 3.1, TA 13.1)		
Reviewed by	Shreya Garg	Date	23/10/2019
Approved by	Anshika Gupta	Date	23/10/2019

Appendix 3. Documents reviewed or referenced

N o.	Author	Title	Reference s to the document	Provider
1	Brightspark Energy Pvt Ltd	Registered PoA-DD	Version 7.0 Dated: 24/07/2019	Others
2	Brightspark Energy Pvt Ltd	SHINE – Distribution of LED Lightbulbs in India-1	Version 3.0 Dated: 10/01/2020	Others
3	Brightspark Energy Pvt Ltd	SHINE – Distribution of LED Lightbulbs in India-2	Version 3.0 Dated: 10/01/2020	Others
4	Brightspark Energy Pvt Ltd	SHINE – Distribution of LED Lightbulbs in India-3	Version 3.0 Dated: 10/01/2020	Others
5	Brightspark Energy Pvt Ltd	SHINE – Distribution of LED Lightbulbs in India-4	Version 3.0 Dated: 10/01/2020	Others
6	UNFCCC	Methodology: AMS II.C“Demand-side energy efficiency activities for specific technologies”	Version 15.0	Others
7	UNFCCC	CDM VVS for PoA	Version 2.0	Others
8	UNFCCC	CDM PS for PoA	Version 2.0	Others
9	UNFCCC	CDM PCP for PoA	Version 2.0	Others
10	Brightspark Energy Pvt Ltd	Monitoring Report	Version 3 Dated: 05/10/2020	CME
11	UNFCCC	CDM-PoA-MR-FORM	Version 3.0	Others
12	Brightspark Energy Pvt Ltd	Emission Reduction Calculation sheet	Corresponding to the current MP	CME
13	Brightspark Energy Pvt Ltd	CME and Financing party agreement	-	CME
14	UNFCCC	Project Webpage: https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/MN26BFZ0CHPIR47GQ1L3YES9XVKTUD/view	-	Others
15	ESPL	Remote Site Visit Documents	13/05/2020 - 15/05/2020	Others
16	Crompton, HPL, FIEM	Technical Specifications	-	CME
17	Brighstspark Energy Limited	ERDA Contract (Emissions Reduction Development Funding Agreement between C-Quest Capital LED Asia Ltd. and Ecoeye Co., Ltd. and Korea Impact Carbon Corporation)	10/01/2020	CME
18	UNFCCC	UN Notification mail for crediting period change	-	CME
19	GOI	CO2 Baseline database	Version 13.0	Others
20	Bharat Test House HI Physix Laboratory Amit test	Test report for life and other specifications: 9W- Test report no. 20170620001 Test report for life and other specifications: 9W- Test report no. HPL/Test/20010001/01 Test report for life and other specifications: 12W- Test report no. HPL/Test/19120535/01 Test report for life and other specifications: 14W- Test report no. HPL/Test/20010001/01	20/06/2017 17/01/2020 27/12/2019 17/08/2018	CME

	and calibration centre			
21	Brightspark Energy Pvt Ltd	Monitoring Survey Agreement between CQCL and Oximus Advisory Services Pvt. Ltd.	28/02/2020	CME
22	Brightspark Energy Pvt Ltd	Monitoring Survey forms	Various	CME
23	UNFCCC	Database for Pas and PoAs	-	Other
24	Brightspark Energy Pvt Ltd	Photos of nameplates of replaced baseline lamps and project lamps	-	CME
25	ESPL	Remote Survey documents		
26	UNFCCC	Sampling and Survey standard	Version 8.0	Others
27	UNFCCC	Guideline-Sampling and surveys for CDM project activities and programmes of activities	Version 4.0	Others
28	Brightspark Energy Pvt Ltd	Sample Size Calculation	-	CME
29	Brightspark Energy Pvt Ltd	Monitoring Survey Result(excel sheet) for operational rate	-	CME
30	Brightspark Energy Pvt Ltd	CPA-Database for CPA-1 CPA-Database for CPA-2 CPA-Database for CPA-3 CPA-Database for CPA-4	-	CME
31	Brightspark Energy Pvt Ltd	Data meter flowchart (with details of run-time meter recordings)	-	CME
32	Brightspark Energy Pvt Ltd	Data Analysis sheet- UP(CPA3) Data Analysis sheet- North East(CPA2) Data Analysis sheet- Telangana (South)(CPA4) Data Analysis sheet – Telangana (North)(CPA1)	-	CME
33	Govt of India	Stamped agreement between CME(Brightspark) and ICL destruction company (Auctus)	22/10/2019	CME
34	Brightspark Energy Pvt Ltd	Training Records (Attendance sheet, Training session photographs)	-	CME
35	Brightspark Energy Pvt Ltd	CME and CPA Implementer Agreement	10/01/2020	CME
36	Brightspark Energy Pvt Ltd	CPA Start date evidence: CPA-1: CPA-2: CPA-3: CPA-4:	13/08/2018 27/11/2018 06/03/2020 05/10/2018	CME
37	ESPL	Random Samples Screenshots	-	Others
38	Brightspark Energy Pvt Ltd	Screenshot of the application interface	-	CME
39	Brightspark Energy Pvt Ltd	Random Sample generator Stat Trek	-	CME
40	Brightspark Energy Pvt Ltd	Declaration of run-time meter calibration requirement from the manufacturer	12/06/2020	CME
41	Brightspark	DISCOM Database for each of the CPAs	-	CME

	Energy Pvt Ltd			
42	Auctus E-recycling solutions	ICL Destruction certificate	Various	CME
43	Brightspark Energy Pvt Ltd	Data meter location sheet (Details of households with Run time meters)- For all the CPAs	-	CME
44	Brightspark Energy Pvt Ltd	Photos and Videos of ICL Destruction	-	CME
45	Brightspark Energy Pvt Ltd	Invoices/Distribution reports (Multiple)	Multiple	CME
46	Brightspark Energy Pvt Ltd	Sample SMS received by end users	-	CME
47	Afferent Wearable Tech Pvt Ltd	Data meter specifications	-	CME
48	Crompton, HPL, FIEM	Technical Specifications-	-	CME
49	UNFCCC	Sample size calculator	-	Other
50	Afferent Wearable Tech Pvt Ltd	Run-time meter recorded value database (operating hours) Link: CPA-1: http://sandpuppy.website/Telangana_South/dashboard.php CPA-2: http://sandpuppy.website/North_East/dashboard.php CPA-3: http://sandpuppy.website/UP/dashboard.php CPA-4: http://sandpuppy.website/Telangana_North/dashboard.php	-	CME
51	Brightspark Energy Pvt Ltd	Corporate organization structure of CQC- Director's Certificate	-	CME
52	Brightspark Energy Pvt Ltd	LED distribution Brightspark Energy Pvt Ltd http://cqc.nirmalaentp.com/web/login	-	CME
53	Brightspark Energy Pvt Ltd	Discounting Factor Calculation Sheet	-	CME
54	Know India: National Portal of India	https://knowindia.gov.in/profile/climate.php	Last accessed on 06/10/2020	CME

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

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

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

Table 2. CLs from this verification

CL ID	01	Section no.	E.3.1	Date : 14/04/2020
Description of CL				
<ol style="list-style-type: none"> 1. The section C.1 of the MR version 01, dated 26/03/2020, mentions "Door to door distribution was mainly carried out for all the four CPAs, however, in some places distribution through kiosks was also undertaken". PP is requested to clarify that how was the collection of IC (or FL) (followed by destruction) ensured in case of distribution through kiosks. 2. The section C.1 of the MR version 01, dated 26/03/2020, also states "INR 15 is collected per bulb as single time fee for destruction of ICL". However, the single time fee per bulb collected for ICL destruction was found to be varying from household to household as checked from the ER sheet (Title: PoA 10484_MP01, Tab: CPA001, CPA002, CPA003; Column: N- in all the respective sheets). PP is requested to clarify the reason for the variation in the ICL destruction fee (per bulb). 3. Section C.1 states of MR version 01, states "Each LED bulb at the time of distribution has been assigned a unique identity by combination of the name of the consumer, grid connection number, address and contact number". However, the ER sheet (Title: PoA 10484_MP01; Tab: CPA001, CPA002, CPA003) does not represent any combination of such numbers. PP is requested to clarify the correct representation of UID in the ER sheet (Title: PoA 10484_MP01). 				
Project participant response				Date : 30/04/2020
<ol style="list-style-type: none"> 1. Distribution team first collected the ICL from the client on site, checked the wattage of each ICL & working condition (with the help of continuity meter), followed the distribution guidelines and provided the equivalent number (maximum 6) if LEDs. The collected ICLs then submitted at the collection point at the end of the day. 2. The amount collected per bulb is fixed for the CPA and is the estimated amount required for the destruction of the ICL 3. Ambiguous statement has been rephrased in the revised MR. All the mentioned information are available against each entry in the ER spreadsheet. However, for more clarity CME has mentioned in the revised MR, that unique grid connection number issued by the DISCOM for each customer is considered as UID for each entry. 				
Documentation provided by project participant				
Revised MR				
DOE assessment				Date: 18/05/2020

1. ICLs were collected from the end-users after checking its working condition through continuity meter at the site and provided the same no. of LEDs as per the distribution guidelines. The ICLs were then submitted at the collection point for ICL destruction. Thus, the clarification regarding the destruction of ICLs for the distribution conducted through kiosks by the CME was found to be acceptable. (Closed)

2. During the remote site visit it was observed that for most of the users under a CPA, the amount for ICL destruction was found to be fixed. However, few inconsistencies in the ICL destruction were encountered for the following end-users:

i) Under CPA 1, it was observed that few of the end-users paid 10 rupees per bulb where as few paid no amount to the distribution team

ii) Under CPA 2, Harendra Nath (UKSC No. 3021041851210123213) paid 30Rs/Bulb where as Rashmohan Sharma (UKSC No. 3021041850959410264) paid 15Rs/Bulb and Prafulla Nath (UKSC No. 3021041850966123549) paid 26 Rs/Bulb.

iii) Under CPA3, it was found that Username: Nagaraju, UKSC No. 1450103078, paid Rs.10/Bulb whereas rest of the end users paid no amount to the distribution team.

Thus, CME is requested to clarify the inconsistencies observed along with the supportive evidences. (Open)

3. As per PP's clarification the UKSC No. stated for each of the consumer is considered as the UID for each of the entry and have revised the statement for the identification of each of the customer in the MR. (Closed)

Project participant response

Date : 26/05/2020

2. during remote site visit, the interviewed users have responded the question related to the amount collected based on their memory. Most of the users in fact didn't remember how much they paid in exchange of LEDs. At the same time there is possibility that the interviewed person has not collected the LED and this was evident during the telephonic calls also. However fixed amount has been collected in each CPA as stated in the MR. All the invoice/consent deed signed by the users (selected for RSV) have been submitted to DOE for further verification.

Documentation provided by project participant

DOE assessment

Date: 28/05/2020

2. The ICL destruction fees collected from the end-users were fixed for each of the CPAs i.e, for CPA-1 per bulb Rs.10, for CPA-2 per bulb Rs.20, for CPA-3 per bulb Rs.15 and for CPA-4 per bulb no fee was collected as checked from the invoices/consent deed shared by CME. (Closed).

Thus, CL is closed.

CL ID	02	Section no.	E.3.1., E.3.4.2	Date : 18/05/2020
Description of CL				

1. Section C of Description of Monitoring plan of CPA-DD for CPA 10484-P1-0003-CP1, on page 24) mentions that the number of LEDs per HH will be restricted to 6. However, from the sampling database of CPA-3 and during RSV it was observed that few HHs (such as Rampal ,UKSC No. BD85607032106) have LEDs more than 6. PP is requested to justify how is the monitoring plan of the PoA is being followed.
2. As per the Data meter analysis sheet (Refer to the yellow highlighted columns of Data Analysis_UP Commented sheet) it was observed that for few of the monitored customers the 90 days monitoring points were not considered. PP is requested to clarify here how is the calculation procedure for the monitored parameter 'Average annual operating hours' ($O_i \text{ project } (9W)/(12W)/(14W)$) has been followed.
3. During the RSV it was observed that none of the sampled HHs were installed with run time meters, PP is requested to provide the list of the end-users considered for operating hours calculation and describe how is the data for the end-users with run-time meters collected.
4. PP is requested to clarify following issues identified after the assessment of Data Analysis sheet of each of the location:
 - i) Operating hours was calculated for which device Project lamp or Baseline Lamp?
 - ii) The data analysis sheet mentions the Device ID and Sim Number, please provide information on how the end-users were selected for calculating the operating hours.

Project participant response	Date : 26/05/2020
<ol style="list-style-type: none"> 1. Generally, the number of LEDs are restricted to six in the software application that has been provided in the mobile handset of every ground staffs/distributors. However, on few mobile handsets, there were some technical errors and the restriction didn't work and the application allowed to enter data of more than six LEDs. This prompted over aggressive ground staffs to distribute more than six bulbs in a HH. Later CME has observed this non-conformity and rectified the software issue, and ground staffs were again restricted through app to distribute only up to 6 LEDs in line with the registered PoA design. However, it was impossible to take back the distributed extra LEDs from HH and thus CME has removed the extra LEDs from the database and only considered six LEDs for emission reduction calculation. CME considers this approach as conservative. 2. As per the applied methodology, "<i>continuous measurement of usage hours of baseline equipment for a minimum of 90 days</i>" is required. CME has followed the same for measurement of operating hours. In some of the location where continuous 90 days measurement could not be followed, CME has not considered those data meters for calculation and highlighted as RED in the data sheet. 3. Details of the consumers where data meters were installed and flow chart describing the data collection procedure have been provided to DOE along with the response. 4. i) as per the applied methodology, data meters were installed on baseline lamps ii) all the information have been provided to DOE. 	

Documentation provided by project participant
DOE assessment
<ol style="list-style-type: none"> 1. CME has removed the extra LEDs from the database for the users (such as Rampal, UKSC No. BD85607032106, CPA0003 Worksheet, Cell: A5578) having LEDs more than 6 and have accordingly revised the ER calculation. The database now has 6 LEDs in maximum per user. (Closed) 2. CME has not considered the samples for the measurement of operating hours where continuous 90 days measurement was not found to be followed. All the data analysis sheet shared by CME have been checked by the assessment team and it has been confirmed that the methodology requirement for the operating hour usage has been strictly followed by the CME. (Closed) 3. CME has provided the Data collection procedure flowchart followed for measuring the operating hours. It was evident from the documents shared by CME that a sim is installed in the run-time meters which keeps on recording the data and uploads it over the server as discussed by the CME in the registered PoA-DD and from the data analysis sheet shared by the CME it was confirmed that the HHs with the run-time meters were different from the sampled HHs as the meters were installed prior to the distribution of project device and operating hours of baseline device was checked and not of project lamp.(Closed) 4.i) Data meters were installed for the baseline lamps as confirmed from the Data meter flow procedure and data analysis sheet. ii) CME has provided the analysis sheet used for calculating the operating hours and have provided the information regarding the end-users selected for measuring the operating hours. (Closed) <p>Thus, CL#02 stands closed.</p>

CL ID	03	Section no.	E.2.1, E.3.1	Date : 05/06/2020
Description of CL				
<ol style="list-style-type: none"> 1. On page 2 of the PoA DD, it is said that LEDs are distributed for free of cost. As per para 48(b) of the applied methodology: "Charging at least a minimal price for efficient lighting equipment" is required. This condition is also stated on page 41 of PoA DD, condition #6, part 3. CME shall explain why the products have been disseminated for free? 2. "The lumen output of the project LEDs would be between 90%to 150% of the lumen output of the baseline lamps" as stated on page 18 of the PoA DD and also required by para 3 of applied methodology. CME shall demonstrate if the condition has been met. 3. For CPA 10484-P1-0002-CP1, The ICLs destroyed are more than the LEDs distributed. CME shall justify. 				
Project participant response				Date : 10/06/2020
<ol style="list-style-type: none"> 1. As per para 48 (b) of the applied methodology, there are three options to limit the secondary market effects & free riders and at least one option is necessary to be fulfilled. Now under SHINE PoA CME has restricted to distribute maximum 6 LEDs per household i.e. complying option 3 for all the CPAs. 2. Lumen output for 60W ICL is 715 and lumen output for replaced 9W LED is 900 i.e. 125.87% of baseline lamp. Similarly, lumen output for 100W ICL is 1350 and lumen output for replaced 12W LED is 1350 i.e. 100% of baseline lamp & lumen output of replaced 14W LED is 1400 i.e. 103.7% of baseline lamp. Therefore, fulfilling the requirement of para 3 of applied methodology. The same has now been updated in the MR also. 3. During the starting phase of distribution under CPA 10484-P1-0002-CP1 there was some technical issue in the mobile application used for registering end users. Therefore, distribution team distributed the LEDs in replacement of ICL and recorded the entries manually during this period. When this matter came into the notice of CME, this process got stopped and new working devices provided to the team for online recording. The electronic database doesn't allow manual intervention and hence, CME can't record those manual entries in the database and decided to forgo the distributed LED bulbs. However, the ICL collected from those end users were handed over to the destruction agency as per the monitoring plan. This is the reason that number of collected ICLs is more than the distributed LEDs. 				
Documentation provided by project participant				
DOE assessment				Date: 11/06/2020
<ol style="list-style-type: none"> 1. As per para 48 (b), it was stated that CME shall follow one of the conditions out of three to limit the undesired secondary market effects and free riders ensuring that replaced lamps are collected and destroyed. In-line to the requirement CME followed the condition of restricting the LED installation number to 6 per HH. The same was traced from the CPA database shared by CME. Thus, the requirement was found to be met and the requirement of charging at least minimal price was not required to be met. (Closed) 2. CME has now demonstrated (under section C.1 of MR Version 2.2) for each of the type of LEDs disseminated that the requirement for the lumen output of 90%-150% has been met. (Closed) 3. There was some technical issue in the mobile application of the database recording stated by CME. The distributed LEDs couldn't be recorded but the ICLs collected by the team was handed over to the ICL destruction team. Thus, it appears in the ICLs destruction certificates which were obtained from a third-party organization. However, CME has not considered the LEDs distributed during this period for ER calculation as confirmed from the CPA database which reflects the no. of LEDs distributed equals to the number of ICLs collected or the ICLs destructed for estimated ERs. Thus, it was confirmed from review of the ER summary sheet, that the extra numbers of ICLs destructed have not been used in the calculation. The approach was found to be justified. <p>Thus, the CL is closed.</p>				

CL ID	04	Section no.	E.3.4.2 , E.3.4.3	Date : 05/06/2020
Description of CL				
<p>For the parameter- Average annual Operating hours of project lamps:</p> <ol style="list-style-type: none"> As per page 42 of PoA DD, details of the method of sampling adopted for monitored parameters shall be submitted to verifying DOE to demonstrate compliance with this applicability criteria. CME shall clarify where the samples have been withdrawn. How the data was collected and used for determination of sample size calculation. The parameter been measured using run time meters. It is not clear: <ol style="list-style-type: none"> How the calibration of the meters have been conducted? The database indicated that the HH can have upto 4 LEDs from the activity. How was the location of the meter selected? How it was ensured that the meter was not installed on the lamps used most frequently? As per the document 'Datameter flowchart' the run time meter send the sevrer about the change of status of the lamp (on/off) in the form of a text message. Kindly describe the process to identify if any messages were being lost due to server error or non-availability of network. How are the daylight variations considered in the calculations, specially since the parameter will only be recorded once. Some of the other PAs (UN ref no.2709) in the similar geographical area indicate an average value of less than 5 hours per day; however a value od 6.66 and 6.77 has been accepted for this project. calculation of the parameter: <ol style="list-style-type: none"> The sample size of the parameter has been determined by using the equation applicable for proportional parameter while 'operating hours' is a mean parameter. 				
Project participant response				Date : 10/06/2020
<ol style="list-style-type: none"> Simple random sampling method was adopted to monitor the Operating hours. In accordance to the applied methodology, operating hours of the baseline equipment was determined using surveys by continuous measurement of usage hours of baseline equipment (i.e. ICLs) for a minimum period of 90 days. Survey was conducted between August 2018 – April 2019 to account for any seasonal variations so that it covers rainy season, winter season and also the summer season. Target population for calculating the samples was the database of grid connected households initially provided by the state level power distribution agencies (DISCOM), which is considered as representative population for the parameter. Sample size calculation sheet, selected samples and monitoring sheets have been submitted to DOE verification. Run time meters: <ol style="list-style-type: none"> Technical specification details of the installed run time meters (sim based) have been submitted to verifying DOE. There is no need of calibration or maintenance of these kind of meters, as they only send message through sim card inserted in the individual meters as and when the bulb turned on and off. These meter either work or do not work. For the monitoring purpose CME has already considered the 20% of non-response during sample size calculation & installed the meters accordingly. At the time of monitoring, some of the meters did not work on/after some time of installation. Details of such meters have been included in the monitoring sheet (but not considered for operating hours calculation) As per applied methodology, registered PoA-DD & CPA-DDs, CME will distribute maximum 6 LEDs per household. Location of the run time meters was not under control of the monitoring team. It was dependent on participating household as they were the one who allowed or not allowed to install the meters in the HH. Because of various rumors, CME had to face many difficulties in convincing people to have installed the run time meter and it became more tough when HH understood that there was a SIM in every meter. Basically, it created doubts on the mind of HH that some agencies in the guise of operating hours measurements are collecting HH data. Few didn't allow thinking that those meters have hidden cameras. Thus, CME had to depend on participating households impulse while deciding to install a meter. At the same time, CME on its own could not ask the HH where to install and again have to depend on their comfortability. Meters were installed on all type of points which included mainly common area, living rooms and bedrooms. The same can be inferenced from the data gathered in the server which has been submitted to DOE and it can be observed that in some HH, the operating hours were too high and in some it was too low in a same locality. However, participating households were encouraged to install the meters at high usage points (common areas) in accordance with para 49 of applied methodology AMS-II.C., ver 15. 				

- c) In the provided flowchart, it is not mentioned that run time meter sends the server about the change of status of the lamp (on/off) in the form of a text message, but meter sends a message signal at the time when lamp gets switched on and lost the signal when the lamp gets switched off. In this manner till the time the server receives the signal from the device it records the device as ON and records the operating time. Now if there is no network, server will not receive the signal and will consider the device as OFF and will not record the operating time. Therefore, in the situation of not receiving the signal, due to non-availability of network, server will consider the device as OFF and will provide always conservative value.
- d) It is to be noted that for each CPA, all the meters were not installed at the same time but were installed in various months in a year. Therefore, the overall monitoring period of each CPA covers all the seasons of the year and in this manner daylight variation has been taken into consideration in the calculation of operating hours.

For referred project activity (UN ref. no. 2709), monitoring was done in the 2012. That time grid availability was not at par with 2018, when this survey was started. On September 25, 2017, India has launched Pradhan Mantri Sahaj Bijli Har Ghar Yojana-Saubhagya (<https://www.india.gov.in/spotlight/pradhan-mantri-sahaj-bijli-har-ghar-yojana-saubhagya>) and it brought 24x7 power availability to every household. As of now India has achieved 99.99% Indian HHs have been electrified (<https://saubhagya.gov.in/>). At the same time in 2012 the per capital electricity consumption was 559.2 kWh whereas in 2018 the same has doubled to 1149 kWh as per Central Electricity Authority data (http://www.cea.nic.in/reports/others/planning/pdm/growth_2019.pdf). This can also be supported by the increase in power supply data shown in “power supply position” (Para 3.0) on Ministry of power website during 2012 and 2018 (<https://powermin.nic.in/en/content/power-sector-glance-all-india>).

At the same time the spending capacity of Indian household has increased and thus the consumption of residential electricity, this can be evident from the various studies based on survey as well as on CEA data (<https://cprindia.org/news/6519>). A study carried out by Prayas (Energy Group), an NGO working in energy sector through analysis-based advocacy in 2017 has shown that the electricity usage in Indian residential sector was up to 6.8 hours/day. Thus CME feels that the operating hours worked out from the data gathered through the run time meters which is free of any manual interventions is the correct reflection of current time.

3. At the time of sample size calculation for monitoring of Operating hours, equation applicable for proportional parameter was used. But when CME applied the equation applicable for the mean parameter, the number calculated for sampling is lesser than the actual monitored numbers, related calculation sheets are submitted to the DOE. Therefore, conducted sampling is in consistence with the sampling guidelines.

Documentation provided by project participant

DOE assessment

Date: 15/06/2020

1. From the data analysis sheet provided by the CME it was observed that simple random sampling method was opted for calculating the samples for operating hours. CME followed the requirement such as continuous measurement of operating hours of baseline equipment for 90days as stated in the applied methodology. The DISCOM database provided by the CME confirmed that the target population selected for each of the CPAs were appropriate (Closed)

2. a) No information on the calibration requirement could be traced from the technical specification document for data meter. CME has shared the declaration from the manufacturer stating that there is no calibration requirement for the run-time meters(Closed).

b) CME has followed the requirement set in the applied methodology for restricting the maximum number of LED installation per HH as 6 (in-line to para 48.(c) of the applied methodology). However, the installation of the run-time meter was not under the control of CME, as the HHs were hesitant to allow the installation due to security reasons, which also hindered the process of installing the meters at the location where the lamps were mostly used. But CME ensured that the meters gets installed at all the types of points including the common areas, living rooms and bedrooms. This was traced from the monitoring survey forms shared by CME which reflects the area where the LEDs have been installed and data analysis sheet which reflects that for few HHs the operating hours are too high whereas for some it was found to be quite low. (Closed)

c) The meter sends the message signal at the time when the lamp turns on and start operating and till the

time it receives the signal from the device it records the device as ON and the moment the signal is lost the device sends no signal and the device is considered as OFF. Thus, when the server is lost or there is any technical issue then the device does not send any signal and is considered as OFF and no operating time for the same gets recorded. Thus, this approach was found to be appropriate as it will provide conservative value. (Closed)

d) The monitoring of the parameters have been done throughout the year starting from August 2018 to April 2019, thereby CME covered all the seasons by installing the runtime meters during the various months of the year as evident from the data analysis sheet which has the recording starting from month of August till April 2019. Therefore, each CPA was found to have covered all the seasons and thereby the daylight variation was taken into consideration in calculating the operating hours.

Again, CME had monitored the data in the year 2018, where the availability of electricity and the daily consumption of electricity per HH was found to be increased as compared to the electricity consumption in year 2012 as checked from the CEA database link provided. Also, the spending capacity of the Indian HH was found to be increased and the electricity usage of the HHs was also found to be increased as evident from the CEA database. Also, it was confirmed from the analysis study published by Prayas group the operating hours of 6.8 hours/day achieved from the monitoring of the operating hours was found to be acceptable. (Closed)

2. The sample size was calculated using incorrect formula before the sampling. The samples checked cannot be changed now. However, the CME has transparently demonstrated in the 'data analysis sheet' that even by applying the correct formula, the reliability has been met and minimum sample size has also been covered. Thus, the final value achieved from the monitoring was found to be correct.

Thus, the CL is closed.

CL ID	05	Section no.	E.3.4.2	Date : 17/08/2020
Description of CL				
CME shall clarify how each of the CPAs meet the condition that operating hours during the project are equal to the operating hours in the baseline since there was no information on the operating hours in the baseline equipment.				
Project participant response				Date : 04/09/2020
The CME wishes to state that in line with clarifications SSC_740 and paragraph 28 of the 'Report of the Twenty-fifth meeting of the Small Scale Working Group' ⁶ , it had the option to monitor the operating hours of either the project equipment or the baseline equipment for calculation of baseline emission and/or project emission. The CME chose to monitor the operating hours of baseline lamps for a period of 90 days at representative households to determine the operating hours of ICLs and the same value was used for establishing the operating hours of LEDs that were distributed under the PoA to replace baseline ICLs. Here the CME also wishes to add that as there could be a tendency on the part of users to operate the project LEDs longer on account of its longer life, hence in order to get the conservative operating hour value, the run time meters were installed on baseline ICLs. The CME has submitted the baseline operating hours data to the verifying DOE.				
Documentation provided by project participant				
DOE assessment				Date: 07/09/2020
The data analysis sheets for each of the CPAs which recorded the operating hours of the baseline equipment for a period of 90 days were reviewed and it was confirmed that CME has followed the requirement of monitoring the operating hours of either the project equipment or the baseline equipment as stated in clarifications SSC_740 and paragraph 28 of the 'Report of the Twenty-fifth meeting of the Small Scale Working Group'.				
In-line to para 22, page 8 of the applied methodology for parameter O _i CME has ensured that there will be no change in the operating pattern of the user with the replacement of ICL to LED. Thus, the monitored value of operating hours can be used for both baseline lamps and project lamps.				
CME's approach of measuring the operating hours value for baseline lamps was found to be acceptable and conservative as due to the energy saving and longer life property of the LEDs it could have been possible				

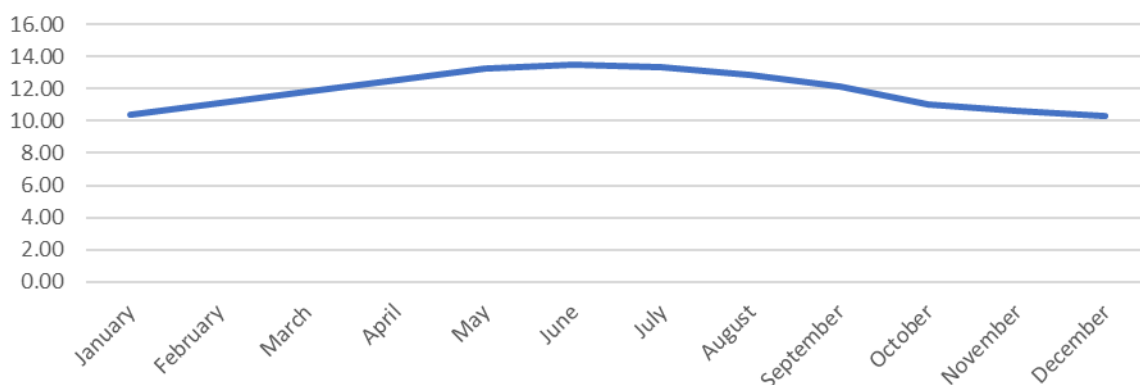
⁶ https://cdm.unfccc.int/Panels/ssc_wg/meetings/025/ssc_025_rep.pdf

that the users would use the LEDs for a longer period of time as compared to the ICL bulbs.

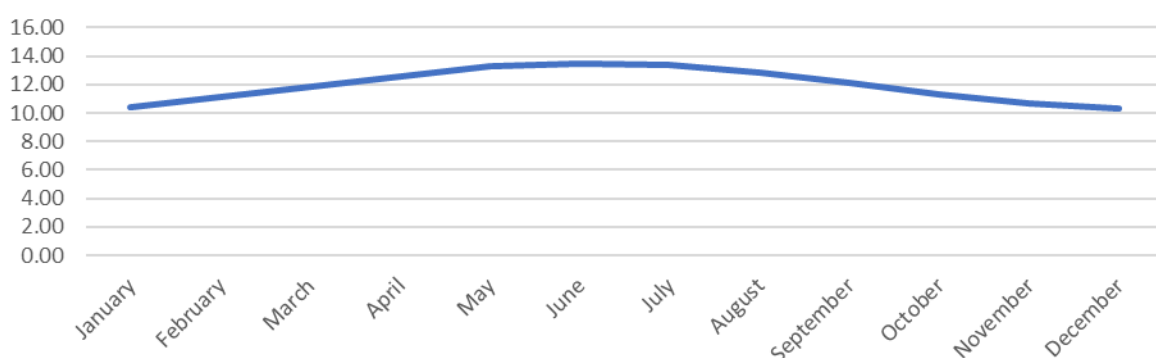
CL#05 stands closed.

CL ID	06	Section no.	E.3.4.2	Date : 17/08/2020																										
Description of CL																														
<p>The CME shall explain how it has considered the seasonal variation i) as survey was conducted between August 2018 – April 2019; ii) the spreadsheet shows that most of datapoints are concentrated from November to December for CPA1, from August to September for CPA2, from September to October for CPA3, and from December to January for CPA4; and iii) operating hours during the winter are usually longer than in summer and the resulted values may not be conservative</p>																														
Project participant response				Date : 04/09/2020																										
<p>The CME agrees to CDM Team's observation that operating hours could be affected by seasons and as correctly pointed out, for all four CPAs there is not enough representation of monitoring with regard to operating hours during summer. months.</p> <p>According to paragraph 22 of applied methodology AMS II.C, version 15; a correction factor is required to be applied in case seasonal variation is observed. Hence in line with the requirement of methodology, the CME has applied a correction factor to account for lower operating hours during summer. The following approach has been used for calculating this factor-</p> <p>As the daylight hours of a place affects the number of hours for which the project LED is used, hence same has been used for calculation of the correction factor. The average hours of darkness (directly proportional to operating hours of the luminaries) for each month was calculated by subtracting daylight hours from 24 hours of the day. The data used is of New Delhi as it was observed to be most conservative in terms of day length variation between summer and winter months.</p>																														
<p style="text-align: center;">Average Daylight Variation- Delhi</p> <table border="1"> <caption>Average Daylight Variation- Delhi (Estimated values)</caption> <thead> <tr> <th>Month</th> <th>Daylight Hours</th> </tr> </thead> <tbody> <tr><td>January</td><td>10.5</td></tr> <tr><td>February</td><td>11.5</td></tr> <tr><td>March</td><td>12.5</td></tr> <tr><td>April</td><td>13.5</td></tr> <tr><td>May</td><td>14.0</td></tr> <tr><td>June</td><td>14.5</td></tr> <tr><td>July</td><td>14.0</td></tr> <tr><td>August</td><td>13.5</td></tr> <tr><td>September</td><td>12.5</td></tr> <tr><td>October</td><td>11.5</td></tr> <tr><td>November</td><td>10.5</td></tr> <tr><td>December</td><td>10.5</td></tr> </tbody> </table>					Month	Daylight Hours	January	10.5	February	11.5	March	12.5	April	13.5	May	14.0	June	14.5	July	14.0	August	13.5	September	12.5	October	11.5	November	10.5	December	10.5
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Average Daylight Variation- North & East India



Average Daylight Variation - NE India



For determining seasonal variation, the CME divided the entire year on the basis of seasons. The months corresponding to each season was determined in line with Government of India classifications and are thus

Winter	January, February
Summer	March, April, May
South West Monsoon (monsoon)	June, July, August, September
North East Monsoon (post monsoon)	October, November, December

<https://knowindia.gov.in/profile/climate.php>

The correction factor for each season was calculated using following equation

$$CF = \frac{(DH_{season} - DH_y)}{DH_y}$$

Where

CF – correction factor

DHseason – Average daylight hours excluding daylight hours of corresponding months for that season

DH_y – Average daylight hours for the year

Using the equation above, the CME determined the correction factor corresponding to each season

Season	Months corresponding to season	Avg. operating hrs after exclusion of months corresponding to particular season	Correction Factor
Winter	January, February	11.723	-0.021
Summer	March, April, May	12.188	0.017

South West Monsoon (monsoon)	June, July, August, September	12.576	0.050
North East Monsoon (post monsoon)	October, November, December	11.530	-0.038

The higher the correction factor, more conservative it will be (lower operating hours).

After applying the correction factor, the operating hours increased for winter, and post monsoon months, whereas it decreased for summer and monsoon months. For each of the CPAs, CME has applied the correction factor calculated for monsoon month considering the most conservative approach.

The resulting operating hours after correction are as follows:

CPA	Operating hours prior to CF	Operating hours post CF
CPA 1	6.30	5.99
CPA 2	6.77	6.43
CPA 3	6.21	5.90
CPA 4	6.48	6.16

Documentation provided by project participant

DOE assessment

Date: 07/09/2020

The applied methodology does prescribe limit the monitoring to be done in any specific period. It only requires a continuous monitoring for 90 days. Thus, the CME had done the monitoring in a way that only 90days continuous data collection was considered as a condition to be followed, because of which most of datapoints are concentrated from November to December for CPA1, from August to September for CPA2, from September to October for CPA3, and from December to January for CPA4. The concentrated data points do not fall under any non-compliance of the applied methodology. However, there is one condition which the applied methodology mentions 'to apply a correction factor to account for seasonal variation' which the CME had missed earlier and has determined and applied it now.

The CME has calculated correction factor by applying following formula:

$$CF = (DH_{season} - DH_y) / (DH_y)$$

CF – correction factor

DH_{season} – Average daylight hours excluding daylight hours of corresponding months for that season

DH_y – Average daylight hours for the year

The above formula is the general mathematical expression for decrease factor as compared to original since the applied methodology does not have any formula for correction factor mentioned in it.

The CME calculated the average hours of darkness which would decide the operating hours of the LED bulbs for the entire year. Then, calculated average of darkness hours (or hours of operation) without considering certain months. These months are January and February for winter, March, April and May for summer, June, July August September for South West Monsoon and October, November, December for North East Monsoon. The classification of weather is as per the data published on government website(<https://knowindia.gov.in/profile/climate.php>). The average hours excluding these months help in determining correction factor for that particular season by applying the formula stated above. For example, average of operating hours with Jan and Feb are used in the above stated formula to get a correction factor - 0.021 for the winter months(see cell E41, tab 'Project Correction Factor', worksheet titled 'Discount factor calculation' . The CME has calculated correction factor in a similar way for each season. The factor has been calculated for representative states too. The highest factor of all was found to be 0.050 which is for the monsoon months in Delhi. The CME has applied this (the highest value) as a correction factor to all the measured values of operating hours and calculated the final value of the parameter and used in the final ER calculation. The value of the parameter and the final achieved ERs have reduced for all the CPAs after applying this factor.

The application of correction factor is prescribed by methodology (para 22, page 8) and the registered monitoring plan (page 22 of the PoA DD). Thus, its calculation and application were found to comply with both.

Thus, CL#06 stands closed.

Table 3. CARs from this verification

CAR ID	01	Section no.	E.1.1	Date :	14/04/2020
Description of CAR					
<p>1. For table A.1.2. of the MR, the template guideline states “In the first column of the table, indicate the titles and UNFCCC reference numbers of all CPAs (including the version of the CPA-DD) included in the PoA as of the end date of this monitoring period”. PP is requested to include the version numbers of the CPA-DD of the CPAs included in the PoA.</p> <p>2. MR template guidelines states “ If a sampling plan was implemented to determine parameter values for each CPA separately or for a group of CPAs covered in this monitoring report (including a single sampling plan covering all CPAs corresponding to the same generic CPA), provide a description of how the sampling for those parameters was implemented in accordance with the sampling plan in the registered or included monitoring plans, including the following information:</p> <ul style="list-style-type: none"> (a) List of CPAs to which the sampling plan was applied; (b) Description of implemented sampling design; (c) Collected data; (d) Analysis of the collected data; (e) Demonstration that the required confidence/precision level has been met; (f) Demonstration that the samples were randomly selected and are representative of the population. <p>Attach to the monitoring report any spreadsheets to present full calculations or detailed information.”</p> <p>CME is requested to update Section E.3 in-line to the MR template guidelines. Also, please mention the dates when the monitoring was conducted.</p>					
Project participant response					Date : 30/04/2020
<p>1. Table A.1.2 of the revised MR has been corrected in accordance with the template guidelines</p> <p>2. Section E.3 of the revised MR has been corrected in accordance with the template guidelines</p>					
Documentation provided by project participant					
Revised MR					
DOE assessment					Date: 18/05/2020
<p>1. PP has revised column 1 of the Table A.1.2 of the revised MR (Version 2.0) in-line to the MR template guidelines.</p> <p>2. PP has revised section E.3 of the MR (Version 2.0) in-line to the template guidelines stated. Thus, CAR#02 stands closed.</p> <p>Thus, the CAR is closed.</p>					

CAR ID	02	Section no.	E.3.1, E.3.4.2	Date :	14/04/2020
Description of CAR					

ER sheet:	
<ol style="list-style-type: none"> <ol style="list-style-type: none"> Section C.1 of the MR version 01, dated 26/03/2020, mentions the start date of LED distribution for 10484-P1-0001-CP1 as 30/08/2018. However, the first installment for CPA01 was found to be done on 13/08/2018 from the sales database provided in the ER sheet (Title: PoA 10484_MP01, Tab: CPA0001; Cell: D5)., Please clarify. Section C.1 of the MR version 01, dated 26/03/2020, mentions the start date of LED distribution for 10484-P1-0002-CP1 as 04/01/2019. However, the first installment for CPA01 was found to be done on 27/11/2018 from the sales database provided in the ER sheet (Title: PoA 10484_MP01, Tab: CPA0002; Cell: D5)., Please clarify. Monitored parameter "$n_{i \text{ project } (9W)/(12W)/(14W)}$", under section E.2.of MR (Version01), mentions the values of 10484-P1-0003-CP1. These values were found to be inconsistent with the ER sheet. (Tab: CPA0003; Cell: G5. The same finding is also applicable for the parameter "$n_{i \text{ operational } (9W)/(12W)/(14W)}$" For the monitored parameter, "$p_{i \text{ project } 9W, 12W, 14W}$", the rated power of LEDs was found to be inconsistent with the ER sheet (Tab: CPA0003). 	
Project participant response	Date : 30/04/2020
<ol style="list-style-type: none"> Start date of LED distribution for each CPA has been corrected in the revised MR For CPA 10484-P1-0003-CP1, 12 W LED was distributed in replacement of 100 W ICL. Same has been corrected in the revised ER spreadsheet. For CPA 10484-P1-0003-CP1, 12 W LED was distributed in replacement of 100 W ICL. Same has been corrected in the revised ER spreadsheet. 	
Documentation provided by project participant	
Revised ER calculation spreadsheet	
DOE assessment	Date: 18/05/2020
<ol style="list-style-type: none"> Start date of the LED installation for each of the CPA has been corrected in the revised MR but PP is requested to provide the evidence for the start date of the LED distribution under each CPA. (Open) Revised ER sheet was found to be correct. Closed The rated power of LEDs distributed under CPA-3 (10484-P1-0003-CP1) has now been revised by the CME. (Closed) 	
Project participant response	Date : 26/05/2020
<ol style="list-style-type: none"> Evidence for the start date of the LED distribution under each CPA have now been submitted to DOE. 	
Documentation provided by project participant	
Start date invoices	
DOE assessment	Date: 28/05/2020
<ol style="list-style-type: none"> The start date of the LED distribution under each CPA as mentioned in the MR (Version 2.1) was found to be correct. CME has provided the evidence for each of the start date of the LED distribution under each of the CPA. 	
Thus, the CAR is closed.	

CAR ID	03	Section no.	E.3.1	Date : 18/05/2020
Description of CAR				
Following issues have been found during the remote site visit:				
<ol style="list-style-type: none"> For few of the end-users the LEDs weren't operational as stated in the monitoring sheet and monitoring survey forms provided by CME. Please provide the clarification for the following end-users: <ol style="list-style-type: none"> Harendra Nath (UKSC No.3021041851210123213, CPA-2), out of 2 LEDs none are operational. Prafulla Nath (UKSC No. 3021041850966123549, CPA-2), Out of 3 LEDs, only 1 was found to be operational For many of the samples under CPA 2, it was found that monitoring team has not visited the HH for conducting the ex-post survey. CME is requested to clarify then how was the monitoring survey requirement was met for those HHs? 				
Project participant response				Date : 26/05/2020

- 1st ex-post monitoring survey was completed for all the CPAs till the 3rd week of March. During the monitoring survey all the LEDs were working at all the locations. Moreover, the distributed LEDs have warranty of 3 years. If any LED of the user gets fused during that period, he can replace the same. During RSV, mentioned users told that their devices got fused less in last couple of days i.e. after the monitoring survey. Now as there is LOCKDOWN in the country due to Corona pandemic therefore those users could not replace their LEDs. As soon the situation in the area resumes, they can contact to the concerned person and get replaced their devices.
2. 1st ex-post monitoring survey was conducted on site for all the selected samples. CME has submitted the filled questionnaire on site and some of the captured photographs for DOE as evidences.

Documentation provided by project participant**DOE assessment****Date:** 28/05/2020

1. As per the monitoring survey forms shared by the CME it was confirmed that all the LEDs monitored during the survey were found to be operational. Also, during the RSV the users confirmed over the call that their bulbs got fused recently i.e. after the monitoring survey was conducted and they have requested for the replacement of the fused bulbs. Due to the complete lockdown in the country currently the CME was unable to exchange the bulbs. Thus, the clarification provided by the CME for the operability of the LEDs was found to be acceptable. (Closed)

2. The evidences shared by the CME related to the monitoring survey confirms that for all the sampled HHs monitoring survey was conducted on-site i.e. by visiting each of the HHs. (Closed)

Thus, the CAR is closed.

CAR ID	04	Section no.	E.3.4.2.	Date : 17/08/2020
Description of CAR				
<p>While calculating the average value, the CME has not considered the meters which collected data for less than 90 days or the meters which gave abysmally high values. However, the spreadsheet shows some extremely high average values (e.g. 22 hours/day in CPA1 and CPA3 and also for some of days some users in all 4 CPAs claim 24 hours as operating hours. As per "Guidelines for sampling and surveys for CDM project activities and programmes of activities" it is required to scrutinize the raw data carefully prior to estimating the mean and checking its reliability, and this can be done using graphical summaries such as histograms, boxplots, and normal probability plots. These plots would show up outliers in the data or any skewness in the distribution of the data. An outlier can be the result of a mistake (wrongly recorded, or wrongly entered onto the computer in which case it can be corrected); or it could be real value - in which case it must be left as it is and included in the analysis. The CME shall explain how this requirement has been fulfilled.</p>				
Project participant response				Date : 04/09/2020
<p>The CME had manually removed outliers, using its judgement to exclude extreme data points such as abnormally high values for a consistent period. Accordingly, all data which could have been a result of malfunctioning of the measurement device were removed from the calculation. However very high consumption data such as 22hrs/day or 24hrs/day for isolated days or a few days in a row were not considered as outliers. The reason for this is that according to applied methodology paragraph 49, the CME had to ensure that project lamps were to be installed in high usage areas within the household including common areas and outdoors where the bulbs are usually left on for the entire night and sometimes continue through the day if the end-user forgets to switch it off. This is also true in situations when the residents go out for a couple of days leaving a bulb in the common area illuminated for the period of absence. When the measuring device is installed at such points, then the measured operating hours would be higher than as compared to other measuring points and can possibly result in 12 or more hours of operation for a certain period. These were considered as real values and hence left as it is.</p> <p>However, given the guidelines provided for treating outliers in raw data in "Guidelines for sampling and surveys for CDM project activities and programmes of activities", the CME has now used box and whisker plots for identifying outliers. The equations applied for determining lower and upper range limits are: Lower Range Limit=Q1-(1.5*Inter Quartile Range) Higher Range Limit=Q3+(1.5* Inter Quartile Range) Where Q1 & Q3 are 1st quartile and 3rd quartile respectively. As a result of application of above, the operating hours of the 4 CPAs have changed to</p>				

	Operating hrs after removing outliers manually (hrs)	Operating hrs after using Box and Whisker plot for removing outliers (hrs)
CPA 1	6.66	6.30
CPA 2	6.77	6.77
CPA 3	6.72	6.21
CPA 4	6.70	6.48

Documentation provided by project participant	
DOE assessment	Date: 07/09/2020

The CME has used box and whiskers to identify outliers meeting the requirement of Guidelines for sampling and surveys for CDM project activities and programmes of activities. As a result of this method, all the absurd values have been not considered to calculate the final value of the parameter and lower values of parameter operating hour for all the CPAs have been applied now. Thus, the CAR stands closed.

Finding open:

1. The CME has not considered the meters which collected data for less than 90 days or the meters which gave abysmally high values. Please clarify.
2. For removing outliers, what are the objective basis and how is it recorded? Is it recorded for each abnormally high value? Are low values by default acceptable? Please clarify and justify how the approach and judgement.

Project participant response		Date : 05/10/2020
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1. As per applied methodology para 22 page 8, continuous measurement of usage hours of baseline equipment for a minimum of 90 days is required for determination of operating hours. *The CME has no option for intervention in the logging of data for operating hours. The CME can clean the data only when it is downloaded for analysis. After receiving the downloaded data from the developer, CME manually sorted data to remove all readings which were less than 90 days. The CME also identified some readings which showed high values for an extended period of time (e.g. 23/24 hours of continuous operation for a month) Such data were also excluded from the calculation as there was a probability that it could be on account of erroneous recording such as malfunction of the runtime meter (although it cannot be ruled out that the device was working for the extended period). To be on a conservative side, CME deemed it fit not to consider this data for calculation purposes.*
2. In addition to exclusion of seemingly erroneous data, the CME also excluded outliers which showed values that were significantly different from the observed values and which could have been missed during manual analysis. The objective basis of removing outliers was to clean the database further of any data that could result in misrepresentation of actual values and could tilt the operating hour calculation in either extreme. The Upper & Lower cut off range were identified using the following equations

Lower Bound Limit=Q1-(1.5*Inter Quartile Range)
Higher Bound Limit=Q3+(1.5* Inter Quartile Range)

All values lying below the lower bound and above the upper bound, were removed from further analysis. Thus, by sieving out incongruous data at two levels, one manual and other by applying statistical tool, the CME has applied the most conservative approach in calculation of hours of operation.

Documentation provided by project participant	
DOE assessment	Date: 06/10/2020

In-line to the applied methodology CME followed the approach of recording the operating hours of the project lamps minimum for 90 days. The recorded data is saved on the server links which was only accessible to the developer of the server. The downloaded .csv files were shared by the CME with the assessment team which was manually sorted to remove the abysmally high values and for the devices having less than 90 days of recordings. The CME also applied the statistical tool to remove the outliers and the approach followed by CME was found to be acceptable as it decreased the chance of any further erroneous data being considered for the calculation of operating hours.

CAR#04 stands closed.

CAR ID	05	Section no.	E.3.4.2.	Date : 17/08/2020
Description of CAR				
<p>The raw data of the time-meters since the spreadsheet shows that approximately 95% of the raw data for average usage hours of CPA1 and CPA3 are exactly the same</p>				
Project participant response				Date : 04/09/2020
<p>The CME admits to the fault in migration of operating hours data for CPA 3 from the central data acquisition site to the excel sheet for analysis. As the access to the database was not with the CME since the site was being managed by third party which had developed it, hence the CME was completely dependent on them for data transfer. It appears that the fault occurred during data download and while a part of data was successfully migrated, a major part of it was replicated from CPA 1. This same sheet was presented to DOE for verification resulting in erroneous data inclusion in CPA 3. This error has now been identified and corrected. Also, the CME has now requested and acquired access to the server link and same has been shared with the DOE.</p> <p>The CME wishes to explain the process of operating hours data measurement and transmission process to demonstrate the stage at which the error occurred.</p> <p>The run time meter consists of a remote unit having tele metering circuit which receives the signals generated by the electronic meters fitted with an external device at the consumer's premises. The remote units are connected to the server through a dedicated communication link which is a mobile link. These meters are non-resettable to avoid accidental resetting. The operating hour recording is triggered when the connected bulb is switched on, sending signal to the server. The server stops receiving the signal, the moment the device is switched off. The time lapse between the start of receipt of signal and the moment it stops receiving it, is recorded and is the operating time for that event. Each event of "on" & "off" for a particular day is added to give the operating hours of the connected device for that day. The recorded data is stored on the server and can be retrieved when required. This data cannot be altered or corrupted. However, when the data is copied from the server to the excel files, possibility of error does exist. It is at this stage when part of data for CPA 3 was copied erroneously from the database of CPA 1. The CME has corrected this error now.</p>				
Documentation provided by project participant				
DOE assessment				Date: 09/09/2020

The process of data measurement for recording the operating hours were cross verified from the data meter flowchart shared by CME and it was confirmed that the recorded data is saved on the server which is then transferred to the excel sheets for ER calculation.

Initially only the developer had the access to the server links and the downloaded data .The developer was responsible for transferring the downloaded data to the excel sheets and CME had the access only to the excel sheets (.csv) shared by the developer which was used by them for the analysis of the data.

The verification team thus could only verify the data logs of the operating hours mentioned in the excel sheet as the server links were not accessible. However, now the server links (sandpuppy server links) for the operating hours have been shared by the CME as they have acquired the access to the link and it was confirmed that the server cannot be manually altered.

Thus, it was only during the transferring of data from the server to the excel sheets by the developer the part of data from CPA 1 was copied to CPA3. The values (for 11 samples of all the CPAs) in the revised data analysis sheets for CPA1 and CPA3 were checked from the server and it was confirmed that CME has now rectified the error and the sheets are free from error.

Thus, CAR#05 stands closed.

Table 4. FARs from this verification

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

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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
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		