MICROENERGY CREDITS – MICROFINANCE FOR EFFICIENT LIGHTING PRODUCT LINES - INDIA

Document Prepared by Earthood Services Private Limited

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Summary:

- **A description of the project**

  The project activity "MicroEnergy Credits – Microfinance for Efficient Lighting Product Lines - India" involves distribution of energy efficient LED lamps to replace the incandescent lightbulbs (ICLs) to households in India. The project is a voluntary initiative as host country laws do not mandate the distribution of LED to the households. The project proponent is MicroEnergy Credits Corporation who is using carbon finance to support local partners engaged in different activities like financing, distribution, and aftersales service and maintenance of various product technologies. This project includes technologies designed to reduce GHG emission through dissemination of energy efficient LED lamps to end-users. This will also reduce the consumption of fossil fuel-based electricity consumption in India.

- **A description of the validation and verification**

  Earthood Services Private Limited has performed a joint validation & verification of the project activity "MicroEnergy Credits – Microfinance for Efficient Lighting Product Lines - India" by MicroEnergy Credits Corporation in India. This assignment was performed on the basis of rules and requirements defined by VCS for the project activities.

  The review of the joint PD-MR, supporting documentation and subsequent follow-up actions (on-site visit and interviews with end-users) have provided Earthood with sufficient evidence to determine the fulfilment of stated criteria. The project correctly applies the approved baseline and monitoring methodology AMS-II.C.: Demand-side energy efficiency activities for specific technologies, version 15.0/5/.

  The project results in reductions of CO_2e emissions that are real, measurable and give long-term benefits to the mitigation of climate change. It is demonstrated that the project is not a likely baseline scenario and the emission reductions attributable to the project are, hence, additional to any that would occur in the absence of the proposed VCS project activity.

  The average annual and total GHG emission reduction for the grouped project 1 is expected to be 93,624 and 655,371 tCO_2e, respectively, over the first 7-year crediting period. The monitoring period identified for the first verification period for the grouped project is from 15/07/2021 to 31/03/2023, and the achieved emission reductions during monitoring period is 48,430 tCO_2e.

- **The purpose and scope of validation and verification**

  The scope of the services provided by the Earthood Services Private Limited is to perform joint validation & verification of the project activity "MicroEnergy Credits – Microfinance for Efficient Lighting Product Lines - India". The scope is to assess the claims and assumptions made in joint project description & monitoring report /1/ against the VCS criteria, UNFCCC criteria, including but not limited to the VCS Standard /3/, VCS Validation and Verification Manual /4/, and other relevant rules and requirements established for Verra.

- **The method and criteria used for validation and verification**

This assignment is an independent and objective review for determination of the monitored reductions in GHG emissions. The joint validation & verification includes the implementation and operation of the project as reported in the project description & monitoring report /1/. The validation & verification process is undertaken by VVB that involves the following:

- The desk review of documents and evidence submitted by the project participant in context of the VCS criteria.
- Undertaking physical site visit, interview, or interactions with the representative of the project participant.
- Reporting audit findings with respect to clarification and non-conformities and the closure of the findings as appropriate.
- Preparing a draft joint validation & verification report of VCS program complying with the VCS requirements.
- Technical review of the draft validation & verification opinion along with other documents as appropriate by an independent competent technical review team for finalization of the joint validation & verification opinion (this report).
- An independent technical review team reviews this report made by the VVB. After the final report is accepted by the Technical Reviewer it is then approved by Earthood Services Private Limited which is processed further according to the VCS and CDM procedures.

- **The number of findings raised during validation and verification**

  During joint validation and verification of the project, a total of 04 CLs and 07 CARs were raised. These have been successfully resolved as provided in Appendix IV of this report.

- **Any uncertainties associated with the validation and verification**

  VVB has undertaken an elaborate audit trail for validation of assumptions and claims contained in joint PD-MR Version 1.7 dated 27/02/2024. Each detail has been checked during site visit and document review which is not only confined to information provided by PP but also by undertaking an independent evaluation of relevant publicly available information by making use of technical expertise of the assessment team. Thus, there are no evident uncertainties associated with the validation.

- **Summary of the validation and verification conclusions**

  The review of the project description & monitoring report, supporting documentation and subsequent follow-up actions have provided Earthood Services Private Limited with sufficient evidence to determine the fulfilment of stated criteria. Earthood Services Private Limited is of the opinion that the project activity "MicroEnergy Credits – Microfinance for Efficient Lighting Product Lines - India" (VCS ID: 4196) meets all the VCS requirements and has correctly applied the CDM approved methodology AMS-II.C.: Demand-side energy efficiency activities for specific technologies, version 15.0/5/. The GHG emission reductions were calculated correctly based on the approved methodology.

Earthood Services Private Limited can certify that the emission reductions achieved in the project description & monitoring report for the monitoring period 15/07/2021 to 31/03/2023 by VCS project activity "MicroEnergy Credits – Microfinance for Efficient Lighting Product Lines - India" amount to 48,430 tCO_2e for grouped project. Therefore, this is being submitted for request for issuance, as per VCS and UNFCCC procedures.

In summary, it is Earthood's opinion that the project activity "MicroEnergy Credits – Microfinance for Efficient Lighting Product Lines - India" as described in the joint PD-MR Version 1.7 dated 27/02/2024 meets all the relevant baseline and monitoring methodology. The monitoring plan adequately provides for the ex-post monitoring of the project's emission reductions. The monitoring arrangements described in the monitoring plan are feasible within the project design and it is Earthood's opinion that MicroEnergy Credits Corporation shall be able to implement the monitoring plan and requirements of VCS standard.

Therefore, Earthood Services Private Limited requests the registration of the project as a VCS project activity and issuance of VCUs under the first monitoring period.

CONTENTS

1 INTRODUCTION

1.1 Objective

MicroEnergy Credits Corporation (PP) has contracted Earthood Services Private Limited (VVB) for joint validation & verification services for the VCS project "MicroEnergy Credits – Microfinance for Efficient Lighting Product Lines - India" (project ID 4196) located in India to jointly carry out validation and verification of the project against the requirements of VCS Program.

The objective of the validation assessment is to determine:

- The project conformity with all the applicable VCS requirements of the current version of the VCS Standard v4.4/3/ and program guide v4.3/2/.
- The project conformity with the applied methodology, including the procedure for the demonstration of additionality specified in the methodology.
- Likelihood that methods and procedures set out in the project description will generate verifiable GHG data and information when implemented.
- The data/information reported is accurate, complete, transparent, and free of material error or omission.

In order to fulfil above objectives, the VVB assigned the task of assessment to validation team that is collectively qualified as per Annex A.2.3.3 of ISO 14064-3 and other internal requirements.

The validation/ verification is an independent assessment of the project by a validation/verification body that determines whether the project complies with the VCS rules.

1.2 Scope and Criteria

The joint validation and verification scope of this assignment is defined as an independent and objective review of the VCS Project Description & Monitoring Report (VCS joint PD-MR) and supporting annexures, which is reviewed by the assessment team against the relevant criteria and decisions by the VCS Board, including but not limited to, the approved baseline and monitoring methodology, applicable tools, VCS standards and guidance. The assessment team has, based on the recommendations prescribed in the latest version of VCS Validation and Verification Manual, employed a risk-based approach, focusing on the identification of significant risks for project implementation and the generation of VCUs.

The scope of this assignment is to:

- Jointly conduct validation and verification in accordance with Earthood's own QMS that is based on the VCS VVM along with the guidance provided by the VCS board to determine

if the project meets all applicable VCS requirements, including those specified in the VCS standard, relevant methodology, tools, and guidelines and processing the same with VCS Program Guide.

- Asses the accuracy, conservativeness, relevance, completeness, consistency, and transparency of the information provided by the project proponents.
- Determine whether the information provided by the project proponent is reliable and credible.
- Present information in the form of joint validation & verification report in a factual, neutral, coherent manner and referencing the sources and assumptions, other forms of validation mean employed.
- Report the findings and conclusions in an objective manner and conduct all validation & verification in accordance with VCS rules and procedures.
- Apply consistent validation and verification criteria in providing expert judgments to the requirements of applicable approved methodology, tools, and also cross check the same.
- Safeguard the confidentiality of all the information obtained during validation and verification.
- Adhere to the principles of independence, ethical conduct, fair presentation, and due professional care in assessment process.

1.3 Reasonableness of Assumptions and Level of Assurance

☐ Limited level of assurance

☒ Reasonable level of assurance

A draft joint validation and verification report that is prepared by the assessment team is reviewed by an independent technical review team (one or more members) to confirm if the internal procedures established and implemented by Earthood are duly complied with and such opinion/conclusion is reached in an objective manner that complies with the applicable VCS requirements as appropriate. The technical review team is collectively required to possess the technical expertise of all the technical area/sectoral scope the project activity relates to. All team members of technical review team are independent of the validation and verification team. The report approved by Technical Manager is endorsed by Managing Director, who is overall responsible to ensure quality, before final release. The further details of applicable procedures and responsibilities about Earthood Quality Management System (QMS) are available on its website (www.earthood.in).

Earthood's validation approach is based on the understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. Earthood planned

and performed the validation by obtaining evidence and other information and explanations that Earthood considers necessary to give reasonable level of assurance that reported estimated GHG emission reductions are fairly stated.

In our opinion the estimated and actual GHG emissions reductions were calculated correctly on the basis of the approved baseline and monitoring methodology AMS-II.C.: Demand-side energy efficiency activities for specific technologies, version 15.0 /5/.

The assessment result has a reasonable level of assurance in validation & verification that GHG assertions are free of material errors, omissions, and misrepresentations. The documents and evidence reviewed are included under Appendix I of this report.

1.4 Summary Description of the Project

The summary description of the grouped project activity has been illustrated in section 1.1 of Joint PD-MR appropriately. As per the given details in PD, information was assessed on-site and found to be consistent. The grouped project activity "MicroEnergy Credits – Microfinance for Efficient Lighting Product Lines - India" involves distribution of energy efficient LED lamps to households in India. The project is a voluntary initiative as host country laws does not mandate the distribution of LED to the households. The project proponent is MicroEnergy Credits Corporation who is using carbon finance to support local partners engaged in different activities like financing, distribution, and maintenance of various product technologies. This project includes technologies, designed to reduce GHG emission by supplying high efficiency LEDs to end-users and replacing with low efficiency Incandescent lamps (ICLs).

The baseline and project scenarios are well described and consistent with the data that was verified during the site visit. The project activity is a grouped project. It involved the distribution and installation of LEDs replacing ICLs . A total of 707,025 LEDs were distributed during the current monitoring period as confirmed from the project distribution database/27/.

The LEDs distributed are significantly reducing the electricity consumption and emissions caused by ICLs while lightning the households. The working conditions of all the distribution LEDs were verified during the on-site audit/17/ and found that 100% end users were found to be using the LED bulbs provided to them. The monitored parameter $N_{i,\ project,\ operational\ (YW)}$ has also been verified from the monitoring survey results/11/ and on-site audit/17/ from which it was confirmed that 100% monitored samples were found to have LEDs in working condition.

The assessment team has interviewed the end users during the on-site audit/17/ and confirmed that the project activity has been implemented as planned and as mentioned in the JPD-MR/1/, the records available and the monitoring survey results/11/. The project has been implemented as described in the JPD-MR and no discrepancy was identified between the project implementation and project description.

The average annual and total GHG emission reduction for the grouped project is expected to be 93,624 and 655,371 tCO2e, respectively over the first 7-year crediting period. The monitoring

period identified for the first verification period for the grouped project is from 15/07/2021 to 31/03/2023, and the achieved emission reductions during monitoring period is 48,430 tCO2e.

2 VALIDATION AND VERIFICATION PROCESS

2.1 Method and Criteria

The validation and verification of the project consists of following steps:

Desk review:

- Review of data and information provided in the VCS joint PD-MR/1/ and corresponding annexures.
- Cross checks the information with the sources without limitations to the information provided by the project proponent.

Follow up actions:

- On-site inspection to physically inspect the project design including, but not limited to, monitoring mechanism.
- Interview with relevant personnel and end-users responsible for information given in the VCS PD-MR/1/.

Reporting of findings:

- Resolution of findings
- Draft joint validation & verification report

Independent technical review:

The project documentation is reviewed by internal technical reviewer in order to independently confirm whether the applicable GHG program requirements were objectively met or not, in addition to whether internal procedures were followed while arriving at the validation and verification opinion. The technical reviewer may accept or reject the validation and verification opinion prepared by the assessment team and gives the reasons. The resolved findings may be opened at this stage or new findings may be identified that are required to be addressed by assessment team and/or project proponents, as appropriate. The technical reviewer is the decision maker on behalf of the Earthood. A positive opinion is issued if all the findings have been satisfactorily resolved and in all other cases a negative opinion is issued unless the contract is terminated by either party before reaching the final opinion.

Earthood keeps all documents and records in a secure and retrievable manner for at least two years after the end of the project crediting period.

2.2 Document Review

This joint validation & verification of the project is performed primarily as a document review of the VCS Joint PD-MR /1/ and associated documents as stated in detail in appendix I of this document. The assessment is performed by a validation & verification team using a protocol. The cross checks between information provided in the VCS Joint PD-MR and information from sources other than those used, if available, the team's sectoral or local expertise and, wherever necessary, independent background investigations.

The joint validation and verification are performed primarily as a document review of the documents submitted at various stages of assessments. The review is performed by assessment team using dedicated protocols. The assessment team cross checks the information provided in the documents (Joint Project Description & Monitoring Report/1/) and information from sources other than those used, if available, and also conducts independent background investigations. Earthood conducted a desk review as under;

a) A review of the data and information presented to verify their completeness.

b) 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.

c) 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

2.3 Interviews

The VVB conducted an on-site visit from 09/06/2023 to 28/06/2023 for validation and verification and the LSC interview was conducted on 04/07/2023 remotely. The on-site visit was conducted as a part of validating the project and also verifying the monitoring procedures followed in the project. VVB conducted the re-audit on 30/11/2023 and 05/12/2023 based on the Verra's project review comments, where in the ER sheet for the required annual surveys conducted, PP has provided information of same set of people for the two annual surveys which was incorrect. Therefore, the duplicate set of data on end users which was erroneously included in ER sheet was discarded by PP and therefore new end users were interviewed based on the revised ER sheet provided by the PP. VVB confirms that PP has changed the approach of ER calculation which has mentioned in detail under section 4.1 of the report and hence remote audit was reconducted due to which the end users interviewed earlier were discarded and therefore removed under section 2.4 of the report.

The following points were discussed as the part of the interviews:

a) Introduction, scope and objective of work, roles and responsibilities of audit team, resources required, and timetable of the onsite audit including venue for closing meeting and any concerns from PP.

b) All the details about the project activity mentioned in the joint PD-MR was cross-checked by discussion with the PP.

c) Compliance of monitoring procedures followed at project site with registered PDD and monitoring methodology.

d) Conducting the site visit by interviewing the end-users.

e) And finally, submission of the audit findings to the client and agreement on the issues raised and agreement on timelines.

The list of PP representatives interviewed by the VVB team is as follows:

Name	Affiliation	Date	Assessment team
Dilkhush Parmar	MicroEnergy Credits Corporation	09/06/2023	Charu Patwal
Satya Ranjan Panda	MicroEnergy Credits Corporation	09/06/2023	Charu Patwal
Shubham	MicroEnergy Credits Corporation	09/06/2023	Charu Patwal
Ved Prakash	Anaxee	09/06/2023	Charu Patwal
Pankaj	Midland	09/06/2023	Charu Patwal
Harsh Gupta	Midland	09/06/2023	Charu Patwal
Rajabul	Sarala	09/06/2023	Charu Patwal

The LSC participants interviewed by the VVB are as follows:

Name	Affiliation	Date	Assessment team
Sudha Devi	End user	04/07/2023	Charu Patwal
Anita Devi	End user	04/07/2023	Charu Patwal
Rajabul Slaam	Branch Manager	04/07/2023	Charu Patwal
Sabera Bibi	End user	04/07/2023	Charu Patwal
Aarti Dey	End user	04/07/2023	Charu Patwal

2.4 Site Visits

The VVB carried out an on-site visit on 09/06/2023, 15/06/2023 and 28/06/2023 for validation and verification respectively by physically inspecting the project technical design and implementation as specified in the VCS PD-MR /1/. VVB has conducted the remote audit/17/ for verification on 30/11/2023 and 05/12/2023 based on the Verra's project review comments where in the ER sheet for the required annual surveys conducted, PP has provided information of same set of people for the two annual surveys which was incorrect. Therefore, the duplicate set of data on end users which was erroneously included in ER sheet was discarded by PP and therefore new end users were interviewed based on the revised ER sheet provided by the PP.

The details of the end users interviewed in the previous Verification audit on 15/06/2023 and 28/06/2023 is now considered irrelevant as new end users were interviewed. Further, VVB has assessed from the new audit results/17/, that the responses/interview of the end-users wouldn't result in increased emission reductions.

The site visit and remote audit was conducted to validate the accuracy and completeness of the project description to ensure the reasonable level of assurance which have been maintained throughout the audit for the purpose of joint validation and verification. The validation and verification team members who visited the site collectively had the competence for the relevant technical area to which project relates. The views obtained during site observation were considered while concluding the validation and verification opinion.

The sampling plan adopted by the VVB for carrying out the joint validation and verification assessment is as follows;

- **Sampling plan for validation of the project:**

The Sampling and surveys for CDM project activities and programmes of activities (Version 9.0)/7/ states under paragraph 28 that "When the project participants or the coordinating/managing entity have applied a sampling approach, the VVB may apply acceptance sampling as described in the steps indicated in paragraphs 29–38 below as part of validation/verification activities".

Since the PP has determined the value of ex-ante parameter oi, $\rho_{i,\ b\ (XW)}$ and $N_{i,\ project,\ operational\ (YW)}$ through sampling of baseline end-users, the validation team conducted acceptance sampling in line with paragraph 30 and 31 of the sampling standard version 9.0/7/.

The validation team selected random sample of PP's baseline survey records (parameter- oi, $\rho_{i,\ b\ (XW)}$, $N_{i,\ project,\ operational\ (YW)}$) to check the acceptability (or otherwise) of the data for each such record with PP's sample records and determined if the PP's sample records meet the requirements.

Sample Size:

AQL	UQL	Producer Risk	Consumer Risk	Sample Size; Min	Acceptance No.

0.5%	20%	10%	10%	11	0

The Validation team covered a total of 11 samples to confirm the rated power of baseline lamps replaced, number of LEDs in operation and the average annual operating hours of XW baseline lamp. All the households interviewed were found to have ICLs and confirmed that baseline survey was conducted. Therefore, no discrepancies were observed.

- **Sampling plan for verification of the project:**

The CDM Standard – Sampling and surveys for CDM project activities and programme of activities (Version 9.0)/7/ states under paragraph 28 that "When the project participants or the coordinating/managing entity have applied a sampling approach, the VVB may apply acceptance sampling as described in the steps indicated in paragraphs 29–38 below as part of validation/verification activities".

Since the PP has monitored parameters ($N_{i,\ project,\ operational\ (YW)}$, ρ_i and O_i) through surveys, verification team conducted acceptance sampling in line with paragraph 30 and 31 of the sampling standard version 9.0/7/.

The verification team selected random sample of PP's monitoring survey records/11/ (parameter- $N_{i,\ project,\ operational\ (YW)}$, ρ_i and O_i) to check the acceptability (or otherwise) of the data for each such record with PP's sample records and determined if the PP's sample records meet the requirements.

Sample Size:

AQL	UQL	Producer Risk	Consumer Risk	Sample Size; Min	Acceptance No.
0.5%	20%	10%	10%	11	0

The verification team covered a total of 11 samples to confirm the operating hours of baseline lamps replaced and number of operational project lamps. Thus, a total of 11 samples were covered as part of the validation:

The list of the end-users interviewed by the assessment team is as follows:

Name	Affiliation	Date, Location	Topics covered	Assessment team
Munna Gupta	Baseline sample end users	09/06/2023, Uttar Pradesh		Charu Patwal* Abhishek Kaul
Reeta	Baseline sample end users	09/06/2023, Uttar Pradesh		Charu Patwal Abhishek Kaul

Anjali Maurya	Baseline sample end users	09/06/2023, Uttar Pradesh	Baseline device in use and its wattage, Number of baseline lamps in HHs, Grid system availability, Average usage of lamps per day (hrs), Meter details and date of installation, Availability of electricity and its minimum hrs., Any other baseline lamp in use	Abhishek Kaul
Ram Kishor	Baseline sample end users	09/06/2023, Uttar Pradesh		Abhishek Kaul
Anita Maurya	Baseline sample end users	09/06/2023, Uttar Pradesh		Abhishek Kaul
Chandrawati	Baseline sample end users	09/06/2023, Uttar Pradesh		Abhishek Kaul
Abhishek Maurya	Baseline sample end users	09/06/2023, Uttar Pradesh		Abhishek Kaul
Prema	Baseline sample end users	09/06/2023, Uttar Pradesh		Abhishek Kaul
Manisha	Baseline sample end users	09/06/2023, Rajasthan		Ashish Yadav
Saroj Kanwar	Baseline sample end users	09/06/2023, Rajasthan		Ashish Yadav
Kishan Kawar	Baseline sample end users	09/06/2023, Rajasthan		Ashish Yadav

*The team leader has attended the audit remotely; however on-site visit has been conducted by the validator.

The list of the end-users interviewed by the verification team is as follows:

Name	Affiliation	Date, Location	Topics covered	Assessment team
Dulari Rani	Monitoring survey end users	30/11/2023, Punjab	LED serial no, its model and wattage, Installation date, Number of LEDs in HHs, Total number of LEDs in HH and number of LEDs in operation, Is baseline lamp still in use, Grid system	Charu Patwal
Mukesh Kumari	Monitoring survey end users	30/11/2023, Punjab		Charu Patwal
Simarjit Kaur	Monitoring survey end users	30/11/2023, Punjab		Charu Patwal

Balwinder Kaur	Monitoring survey end users	30/11/2023, Punjab	availability, Average usage of lamps per day (hrs), Availability of electricity and its minimum hrs., Is baseline lamp been collected by the PP, when were the Monitoring surveys conducted	Charu Patwal
Surjit Kaur	Monitoring survey end users	30/11/2023, Punjab		Charu Patwal
Sudama Devi	Monitoring survey end users	05/12/2023, Bihar		Abhimanyu Singh Wazir
Manphi Devi	Monitoring survey end users	05/12/2023, Bihar		Abhimanyu Singh Wazir
Nilam Devi	Monitoring survey end users	05/12/2023, Bihar		Abhimanyu Singh Wazir
Manju Devi	Monitoring survey end users	05/12/2023, Bihar		Abhimanyu Singh Wazir
Anita Devi	Monitoring survey end users	05/12/2023, Bihar		Abhimanyu Singh Wazir
Lukhiya Devi	Monitoring survey end users	05/12/2023, Bihar		Abhimanyu Singh Wazir

2.5 Resolution of Findings

The validation and verification protocols used for the assessment is designed in accordance with the latest version of latest VCS Program Documents. The validation and verification protocols are an internal document in Excel and available on request.

As an outcome of the joint validation and verification process, the assessment team can raise different types of findings. Clarification request (CL) is raised if information is insufficient or not clear enough to determine whether the applicable VCS/CDM requirements have been met. Where a non-conformance arises the validator/verifier raised a Corrective Action Request (CAR). A CAR is issued, where:

- The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions.
- The CDM/VCS requirements have not been met.
- There is a risk that emission reductions cannot be monitored or calculated.

Forward Action Request (FAR) is raised during validation/verification to highlight issues related to project implementation that require review during the first verification of the project activity. FARs do not relate to the VCS/CDM requirements for registration.

Irrespective of the nature of findings, all of these are given to PP in a separate finding document. In this document, the project proponent(s) is/are given the opportunity to respond to the findings. Based on the responses by PP along with relevant supporting documents/evidence the validation team determines whether the findings are resolved or not. The findings may also be raised at later stage e.g., during internal technical review process and these are also communicated/dealt in the same manner as described above. The draft joint validation & verification report is also prepared during this period reflecting the status of the findings, if any, as appropriate.

In summary, the type and total number of findings that were raised are indicted below:

Type of Finding	CAR	CL	FAR
Total Findings	07	04	00

All the findings raised during this joint validation & verification of the project are included under Appendix IV of this report.

2.5.1 Forward Action Requests

00 Forward Action Requests (FARs) was raised during this assessment.

3 VALIDATION FINDINGS

3.1 Project Details

Project type, technologies and measures implemented, and eligibility of the project

The project “MicroEnergy Credits – Microfinance for Efficient Lighting Product Lines - India” is a micro-scale grouped project activity which employs baseline and monitoring methodology AMS-II.C. version 15.0/5/ and falls into sectoral scope 03 and is appropriately selected in the VCS joint PD-MR and is implemented in India. The project category and type are correctly indicated in the VCS joint PD-MR/1/. It has been indicated as well as accepted that it is a grouped project.

The project activity undertakes distribution of LEDs in rural India which was confirmed during the on-site visit/17/. The grouped project activity envisages that each project activity batch will distribute 9W and 12W LEDs to the grid connected households for domestic lighting usage. The total number of 9W LEDs distributed in the Grouped project is 702,281 and 12W LEDs are 4,744 , maintaining the energy saved by each LED under the threshold limit of 20 GWh/yr limit for micro-scale projects.

The project activity results in the reduction of GHG emissions due to reduced electricity consumption by the relatively efficient LEDs. The rated operational lifetime of the LED bulbs being distributed is as verified from the manufacturer's specifications/10/ is 25,000 hrs i.e., 7-11 years. Since the operational lifetime is beyond the first crediting period of the project activity, therefore no replacement of the bulbs during the first crediting period is required.

Also, the PP is not claiming emission reductions for the inverter component of the LED which involves using the LED as back up during power cut offs. The inverter LEDs operate on the principle that they have in-built battery which needs to be charged for 6-8 hours for 4 hours of battery backup. The project lamp is used in the existing socket of the ICL which was confirmed during the on-site visit/17/ by taking interviews with the end users. The baseline scenario for this component is use of kerosene lamps during power cut offs which is verified from the baseline surveys and audit visits. The project emissions result from charging the battery for 6-8 hours using grid electricity. The VVB has verified from an independent ER calculation sheet for this component using the latest version of the methodology, AMS III AR submitted by PP, baseline surveys and interviews during on-site visit which confirms the inverter component results in emission reductions, however, PP is not claiming these to avoid monitoring costs and use of additional methodology. The project is claiming ERs only for normal operations of the LED and not for inverter component of the LED. The six hours of operations used in ER calculations refer to the operating hours taken into account when utilizing grid electricity. The VVB is of the opinion that not claiming ERs for this component results in conservative ERs and was found acceptable.

The information contained in section 1.11 of the joint PD-MR/1/ provides a clear description of the project activity. The assessment team finds the description to be complete and the accuracy of the project description been verified during the on-site interviews/17/.

CAR 01 was raised and resolved.

Technical specifications of project lamps

The grouped project activity envisages distribution of various models of LEDs i.e., Sun King, D.light, Crompton, Ally and Bajaj under the initial instances The description of the LED models is given in the joint PD-MR/1/ and was confirmed from manufacturer's specification document/10/. The details of the LED provided below were confirmed from the manufacturer's specifications/10/:

Technical specification of project lamps 9W (Sun KingTM Bulb, D.light Bulb, Crompton Bulb, Bajaj LEDz Bulb, Ally LED Bulb)

Technical specification	Value (9W)	Value(9W)	Value(9W)	Value(9W)	Value(9W)
Rated Wattage	9 W (Sunking Bulb)	9 W (D.light Bulb)	9W (Crompton Bulb)	9W (Bajaj LEBz Bulb)	9 W (Ally LED Bulb)
Input Voltage	220-230V, 50 Hz	220-230V, 50 Hz	220-230V, 50 Hz	100V-300V, 50 Hz	100V-264V, 50 Hz
Output Voltage Range	100-300V AC	100-300V AC	100-300V AC	100-300V AC	100-264V AC
Surge Protection	>=3.5kVA	>=3.5kVA	>=3.5kVA	>=3.5kVA	>=3.5kVA
Charging Time	8-10 Hours	8-10 Hours	8-10 Hours	8-10 Hours	8-10 Hours
Backup time	Upto 4 hours	Upto 4 hours	Upto 4 hours	Upto 4 hours	Upto 4 hours
Holder	B22	B22	B22	B22	B22
Colour temperature	6500 K	6500 K	6500 K	6500 K	6500 K
Initial lumen	900 Ln[1]	900 Ln	900 Ln	900 Ln	900 Ln
Service level as compared to baseline lamp	126%, 104%	126%, 104%	126%, 104%	126%, 104%	126%, 104%
CRI	>=80	>=80	>=80	>=80	>=80
Power factor	>0.90	>=0.95	>0.90	>0.90	>0.90
Rated Life	25,000 hours	25,000 hours	25,000 hours	15,000 hours	15,000 hours

Technical specification of project lamps 12W (D.light Bulb)

Technical specification	Value(12W)
Rated Wattage	12W
Input Voltage	220-230V, 50 Hz
Battery	-
Cycle Lifetime	500
Output Voltage Range	-
Surge Protection	<=4kVA
Charging Time	5-6 hours
Backup time	Upto 4 hours
Holder	-

[1] On AC, backup light output - lumen reduces upto 50%

Colour temperature	-
Initial lumen	1200
Service level as compared to baseline lamp	139%,128%
CRI	>=80
Power factor	>0.90
Rated Life	25,000 hours

PP has provided the reference for wattage and lumen values in the revised JPD-MR/1/ section 1.1. VVB has verified the reference link/44/ provided and confirms that the lumen values of 9W and 12W bulbs were 900 lumens and 1200 lumens respectively and the same has been stated throughout the joint PD-MR. Furthermore, the wattage and lumen values were also verified from the technical specifications/10/ provided by the PP.

The project activity does not fall under the category of excluded projects as per Table 1 of the VCS Standard v4.4/3/ and is therefore deemed eligible under the scope of the VCS Program as discussed below:

Excluded Activity	Applicability	VVB Assessment
Grid-connected electricity generation activities using hydro-power plants/units	N/A. The GP reduces GHG emissions due to energy efficiency measures by introducing energy efficient LEDs	The proposed grouped project disseminates LED which is not related to hydro-power plants. Thus, exclusion condition is not applicable.
Grid-connected electricity generation activities using wind, geothermal, or solar photovoltaic (PV) power plants.	N/A. The GP reduces GHG emissions due to energy efficiency measures by introducing LEDs and does not involve generation of electricity.	The proposed grouped project disseminates LED, which is not related to wind, geothermal, or photovoltaic (PV) power plants. Thus, exclusion condition is not applicable.
Activities generating electricity and/or thermal energy for industrial use from the combustion of non-renewable biomass, agro-residue biomass, or forest residue biomass	N/A. The GP reduces GHG emissions due to energy efficiency measures by introducing energy efficient LEDs and does not involve generation of electricity/thermal energy for industrial use.	The project does not involve any component of electricity generation. Thus, exclusion condition is not applicable.

Activities recovering waste heat for combined cycle electricity generation, or to heat/cool via cogeneration or trigeneration.	N/A. The GP reduces GHG emissions due to energy efficiency measures by introducing energy efficient LEDs and does not involve generation of heat for producing electricity.	The project does not involve any component of electricity generation or heating/cooling via cogeneration or trigeneration. Thus, exclusion condition is not applicable.
Activities that reduce hydrofluorocarbon-23 (HFC-23) emissions	N/A. The GP reduces GHG emissions due to energy efficiency measures by introducing energy efficient LEDs which is not included under this activity, as mentioned.	The proposed grouped project disseminates LED which does not involve HFC-23. Thus, exclusion condition is not applicable.
Activities generating electricity and/or thermal energy using fossil fuels, and activities that involve switching from a higher to a lower carbon content fossil fuel.	N/A. The GP activities do not include the generation of electricity and/or thermal energy using fossil fuels, including activities that involve switching from a higher carbon content fuel to a lower carbon content fuel.	The project does not involve any component of electricity generation. Thus, exclusion condition is not applicable.
Activities replacing electric lighting with more energy-efficient electric lighting, such as the replacement of incandescent electrical bulbs with compact fluorescent lights (CFLs) or light emitting diodes (LEDs).	The GP activities includes the replacement of electric lighting with more energy efficient lighting but it is not large-scale project but micro-scale project activity instances (LEDs) shall be added.	The project is micro-scale Grouped project. Thus, exclusion condition is not applicable.
Activities installing and/or replacing electricity transmission lines and/or energy-efficient transformers.	N/A. The GP activities do not include the installation and/or replacement of electricity	The project does not involve any component of electricity generation. Thus, exclusion condition is not applicable.

	transmission lines and/or energy efficient transformers.	

Project design, including eligibility criteria for grouped projects

The VCS joint PD-MR/1/ includes sufficient information with regard to project activity, system and product description and distribution plan. Further description on application and information on the LED technology is given in Project Instance.

For the inclusion of new PIs within the project activity under the grouped project, the project proponent shall ensure that the activity instances meet the eligibility criteria set out in section 2.2 of the applied methodology AMS-II.C./5/ and clause 3.6.16 and 3.6.17 of the VCS Standard v4.4/3/.

Project activity under VCS is assessed below:

a) Eligibility conditions

S.No.	Scope	Applicability	VVB Assessment
1.	The seven Kyoto Protocol greenhouse gases.	The GP reduces GHG emissions associated with the combustion of cooking fuels. Gases included are CO2, CH4, N2O.	PP has considered the GHG gases within the scope of Kyoto protocol which are reduced using energy efficient lighting under the grouped PA.
2.	Ozone-depleting substances (ODS).	The GP does not involve any ODS.	The proposed grouped project does not involve any Ozone-depleting substances as it involves only dissemination of energy efficient LEds.
3.	Project activities supported by a methodology approved under the VCS Program through the methodology development and review process.	The LED to be distributed in the GP applies the methodology "AMS-II.C.: Demand-side energy efficiency activities for specific technologies; Version: 15.0." which is a VCS approved methodology.	The grouped project activity applies AMS-II.C.: Demand-side energy efficiency activities for specific technologies; Version: 15.0/5/, applicability of the methodology is assessed in detail under section 3.4 of this report.

4.	Project activities supported by a methodology approved under a VCS approved GHG program, unless explicitly excluded under the terms of Verra approval.	Not applicable.	Not applicable.
5.	Jurisdictional REDD+ programs and nested REDD+ projects as set out in the VCS Program document Jurisdictional and Nested REDD+ (JNR) Requirements.	Not applicable.	Not applicable.

b) Project requirement as per section 3.1 of the VCS Standard version 4.4

S.No.	Requirement	Justification	VVB Assessment
1.	Projects shall meet all applicable rules and requirements set out under the VCS Program, including this document. Projects shall be guided by the principles set out in Section 2.2.1	The project is meeting all the applicable rules and requirements set out under VCS program which includes VCS Standard version 4.4, VCS Program Guide v4.4, VCS Program Definitions v4.4. Further, the project is guided by the principles set out in section 2.2.1 of the VCS Standard v4.4.	VVB has assessed the joint PD-MR/1/ and confirms that the grouped project activity is meeting all applicable rules and requirements as per VCS Program. Also, Section 2.21 of the VCS Standard v4.4/3/ contains the guiding principles for this project.
2.	Projects shall apply methodologies eligible under the VCS Program. Methodologies shall be applied in full, including the full application of any tools or modules referred to by a methodology, noting the exception set out in Section 3.14.1. The list of	The project has applied the approved CDM methodology AMS.II.C version 15.0 in the project activity. Further all the applicable tools including Methodological tool 19: Demonstration of additionality of	VVB has assessed the joint PD-MR/1/ and confirms that the PP has eligibility criteria of the applied methodology is applicable for the project. The grouped project activity applies AMS-II.C.: Demand-side energy efficiency activities for

	methodologies and their validity periods is available on the Verra website	microscale project activities version 10.0, CDM Tool 07: Tool to calculate the emission factor for an electricity system, version 7.0, Tool 10: Tool to determine the remaining lifetime of equipment (Version 01), Tool 1: Tool for the demonstration and assessment of additionality, version 7.0 and Guidelines for SSC CDM methodologies Version 23.1, Guidelines for sampling and surveys for CDM project activities and programmes of activities, version 04.0 have been used.	specific technologies; Version: 15.0/5/, applicability of the methodology and the relevant tools is assessed in detail under section 3.4 of this report.
3.	Projects shall apply the latest version of the applicable methodology in all cases unless a grace period applies to the project as set out in 3.21 below. Projects must update to the latest version of the methodology when reassessing the baseline and renewing a crediting period	The project has applied latest active version of the methodology AMS II.C, version 15.0 which shall be reassessed at the renewal of crediting period.	The grouped project activity has applied the latest version of AMS-II.C.: Demand-side energy efficiency activities for specific technologies; Version: 15.0/5/, applicability of the methodology is assessed in detail under section 3.4 of this report. Also, the latest version of the methodology will be updated when the project will be reassessed for the baseline and renewal of the crediting period.

4.	Projects and the implementation of project activities shall not lead to the violation of any applicable law, regardless of whether or not the law is enforced.	The project is a voluntary initiative by the PP. There are no laws in India which enforces the project activity. and its implementation does not lead to violation of any laws.	There are no mandatory policies and/or regulations in the host country that mandates distribution and/or installation of LED lighting equipment in households. Thus, there are no rules or regulations in the host country India for implementation of the PIs. The same has been verified by the assessment team through independent research.
5.	Where projects apply methodologies that permit the project proponent its own choice of model (see the VCS Program document VCS Program Definitions for the definition of model), the model shall meet the requirements set out in the VCS Program document VCS Methodology Requirements, and it shall be demonstrated at validation that the model is appropriate to the project circumstances (i.e., use of the model will lead to an appropriate quantification of GHG emission reductions or removals).	The project has applied the model used in the latest VCS approved methodology AMS II.C, version 15.0 and the project has not used its own model. The condition is not applicable to project.	PP has applied the CDM approved methodology AMS II.C, version 15.0/5/ and has not used any other or its own model to meet the requirements. Hence, this condition is not applicable.
6.	Where projects apply methodologies that permit the project proponent to choose a third-party default factor or standard to ascertain GHG emission	The project has not used any methodology recommended third-party default factor to ascertain GHG emissions data. The	VVB has reviewed the joint PD-MR/1/, Ex-ante ER sheet/8/ and ER sheet/16/ and confirms that PP has not used any third-party default factor

	data and any supporting data for establishing baseline scenarios and demonstrating additionality, such default factor or standard shall meet the requirements set out in the VCS Program document VCS Methodology Requirements	project has used CDM Standard for Sampling and surveys for CDM project activities and programmes of activities for sample size determination which meets the requirements set out in the VCS Program document VCS Methodology Requirements.	for calculating GHG emissions data. Also, PP has used CDM Standard Sampling and surveys for CDM project activities and programmes of activities version 9/7/ for determining the sample size to meet the VCS requirements.
7.	Where the rules and requirements under an approved GHG program conflict with the rules and requirements of the VCS Program, the rules and requirements of the VCS Program shall take precedence	The project has followed the rules and requirements of the VCS program.	VVB has assessed the joint PD-MR/1/ and confirms that the grouped project activity is meeting all applicable rules and requirements as per VCS Program.
8.	Where projects apply methodologies from approved GHG programs, they shall conform with any specified capacity limits (see the VCS Program document VCS Program Definitions for the definition of capacity limit) and any other relevant requirements set out with respect to the application of the methodology and/or tools referenced by the methodology under those programs.	The project has referred to an approved small-scale CDM methodology, AMS II.C. As per para 15 of the Tool 19, Demonstration of additionality of microscale project activities version 10.0, "If each of the units contained in the CPA satisfies the condition to qualify as a 'microscale CDM unit', then the coordinating/managing entity is not required to demonstrate	The grouped project has the average energy savings of LED of 0.118 MWh/yr which is below 20 GWh/yr of the micro-scale type II project limits as verified from the Ex-ante Emission Reduction Sheet/8/ and therefore qualifies as microscale CDM unit.

		compliance of the CPA with the microscale or small-scale thresholds at the aggregate level of the CPA. In such cases, the requirements related to debundling stated in paragraph 6 above do not apply". As shown in the tab 'Emission Reduction' of the ex-ante emission reduction sheet the average savings of LED is 0.118 MWH/yr, therefore, it qualifies as microscale CDM unit (<20GWh/yr) and hence the project is not required to demonstrate compliance with the microscale or small-scale thresholds at the aggregate level.	
9.	Where Verra issues new VCS Program rules, the effective dates of these requirements are set out in Appendix 3 Document History and Effective Dates or equivalent for other program documents, and are listed in a companion Summary of Effective Dates document which corresponds with each update.	The grouped project has referred to the most updated VCS program Rules available at the time of Requesting Registration of the project.	VVB confirms that the PP has referred to the latest VCS Program rules and documents that were available at the time of requesting registration of the project.

c) **Eligibility criteria to include PAIs**

S.No.	Eligibility Criteria for the inclusion of new	How the new project activity instances comply	How the PI in project activity	VVB Assessment

	project activity instances		is complying and evidences	
1.	Project Activity Instances (PAIs) must meet the applicability conditions set out in the applied methodology applied to the project.	Only those PIs which will meet the applicability conditions set out in the methodology AMS II.C "Demand-side energy efficiency activities for specific technologies; Version: 15.0" shall be included.	PI is compliant with the applicability conditions set out in the applied methodology AMS II.C as demonstrated in Section 3.2 of this project description.	The validation team has reviewed the joint PD-MR/1/ and the Ex-ante ER sheet/8/ and is of the opinion that all the applicability conditions have been appropriately set out and applied.
2.	Use the technologies or measures specified in the project description.	Only LEDs that confirm with the GP description are to be distributed in the project. Only PIs with service level (e.g. rated capacity or output) between 100% and 150% of the service level of the baseline equipment shall be included.	The 60 W (715 ln) and 70 W (865 ln) ICLs are being replaced with similar output LED lamps i.e. 9W LED and 12W LED respectively. **Evidence:** manufacturer specification	In accordance with table 2 of the applied methodology/5/, PP is required to check the service level requirement to match the output of the baseline ICLs after the replacement with LED of 9W and 12W. Range of service level is 100% to 150%. Hence, the baseline bulb with 60W can be replaced with 9W LED. Similarly, 70W can be replaced with 12W LED. The future PIs will also be verifiable from the product manufacturer

				specification/10/ to ensure that the required service level in line with the applied methodology is met.
3.	Apply the technologies or measures in the same manner as specified in the project description.	The LED bulbs distributed will adhere to the GP description and shall replace inefficient ICLs.	a) The manufacturer's technology description describes the applicability of the technology to the PI to be distributed under the GP. b) The ICLs are being replaced with equivalent lumen LEDs This information will be stored in the monitoring and data collection database. **Evidence:** manufacturer specification and distribution database	The validation team has reviewed the manufacturer's specifications/10/ of the LEDs and witnessed the distribution activity/27/ to ensure that the eligibility criteria is being met. The validation team is of the opinion that the technology measures criteria is complied by each project instance.
4.	Are subject to the baseline scenario determined in the project description for the specified project activity and geographic area.	All new PIs will be implemented only in regions within the geographic borders of India subject to the same baseline	a) GPS/location data captured from each end user will demonstrate the location of the project.	The validation team has reviewed the project distribution database/27/ and distribution interview/17/ responses to

		scenario determined in Section 3.4 in this report.	b) Baseline shall be recorded during distribution of the LEDs This information will be stored in the monitoring and data collection database which shall be used to confirm that the ICLs are replaced with energy efficient LEDs and are distributed within the geographic boundary of India. **Evidence:** Distribution database	determine the location of the project. The baseline scenario is appropriately described in section 3.4 of the joint PD-MR/1/ and in line with the VCS requirements. Project also conforms to para 51 of the applied methodology/5/ according to which "the assumed baseline scenario is that lighting by the project lamps would have been provided by the lamps collected and replaced by the project activity". Thus, this eligibility criteria have been met by the project activity instances. Similarly, future PIs will also be verified from the Baseline Surveys/12/ and distribution database/27/.
5.	Have characteristics with respect to additionality that are consistent with the initial instances for the specified project	The PIs added to this GP shall comply with all the additionality conditions listed in section 3.5 and	The project is additional and is described in section 3.5 of this document.	PP has calculated NPV of the project activity and provided detailed investment analysis sheets/33/. The

	activity and geographic area.	should be clearly defined in the joint PD&MR or subsequent standalone MRs.	**Evidence:** An investment analysis sheet to prove the additionality of the PI has been submitted to the VVB.	validation team has checked all the input values (cash inflow and cash outflow) opted for NPV calculation with their respective evidence/34/ and found it appropriate. The financial calculations have been verified and found to be correct. It is clearly established that the project activity has a negative NPV without revenues. Thus, the project activity is found to be eligible. Please refer to section 3.4.5 of this report for details.
Eligibility Conditions specific to Inclusion of New Project Activity Instances				
6.	Occur within one of the designated geographic areas specified in the project description.	New project activity instances will be located within the geographic boundaries of India. The new Project Instances geographic location will be defined in the new PIs monitoring reports.	The Project Instances are located in rural regions across India. **Evidence:** Project database (distribution record) with contact details of HHs	As per the baseline survey report/12/ and the on-site audit/17/ conducted by the validation team, it was established that the project activity is located within the boundary of India. Similarly, PIs included in future will also be verified from the project

				database/ distribution record/27/.
7.	Conform with at least one complete set of eligibility criteria for the inclusion of new project activity instances. Partial conformance with multiple sets of eligibility criteria is insufficient.	The Project instances under the Grouped project shall confirm to the complete set of eligibility criteria listed in this section.	The project activity instances meet the complete set of eligibility criteria set out in this section as justified in this column for all criteria.	As evident from the above assessments, there has been more than one set of eligibility criteria that the project activity conforms with.
8.	Be included in the monitoring report with sufficient technical, financial, geographic, and other relevant information to demonstrate conformance with the applicable set of eligibility criteria and enable evidence gathering by the validation/verification body.	The complete details of the project instances included in the Grouped project like technical, geographical and other relevant information along with supporting documents to demonstrate conformance with the eligibility criteria listed in this section should be provided to the VVB for transparent Validation and Verification of the project.	The PP has provided the technical details in section 1.11 of this document along with the manufacture specification, geographic location in section 1.12 along with the KML file, distribution database to the VVB.	VVB has gone through the distribution records/9,27/ with GPS coordinates/30/, manufacturer specification/10/ and confirms that sufficient technical, financial geographic and other relevant information have been demonstrated for new project instances in the monitoring report.
9.	Be included in an updated project description, with updated project location information	The information about the Project Instances wrt technology, locations should	The Project Instances that are being included in this Monitoring	VVB has reviewed the distribution records/9,27/ with GPS coordinates/30/,

	(as set out in Section 3.11), which shall be validated at the time of verification against the applicable set of eligibility criteria	be updated in the project description and the inclusion of new instances should be validated at the time of Verification for the eligibility criteria listed in this section.	period have all the information i.e. technical details, geographical location included in this document along with providing the supporting documents (manufacture specifications, contact details of each household in distribution database, KML files, baseline survey results etc.) to the validating and Verifying VVB.	manufacturer specification/10/, baseline survey results/12/ and confirms that sufficient technical, financial geographic and other relevant information have been demonstrated for new project instances in the project description.
10.	Have evidence of project ownership, in respect of each project activity instance, held by the project proponent from the respective start date of each project activity instance (i.e., the date upon which the project activity instance began reducing or removing GHG emissions).	New PIs will demonstrate ownership by the project proponent, from the start date of the PI.	Project ownership, as described in Section 1.7 of this document, is applicable to all PIs included in this GP. For each PI the end user has signed the End User Agreement releasing all rights to GHG emission generated from the PI which is	Project ownership as described in section 1.7 of the joint PD-MR/1/ is appropriately defined. The assessment team has verified the same from the Sample End User Agreement forms/14/ and the carbon waiver agreement/31/. Therefore, this criterion requirement is met.

			the property of the PP. **Evidence:** Sample End User Agreements signed by end user submitted to VVB	The evidence in the form of sample End User Agreement is found to be sufficient and credible for confirmation of ownership in inclusion of future PIs.
11.	Have a start date that is the same as or later than the grouped project start date.	Only PIs having a start date that is the same as or later than the GP start date will be included in the GP. The start date of GP is the date of distribution of first unit as per section 1.8 of this document. And subsequent additions will have start date after GP start date only.	The start date of project is 15-07-2021 (start date of distribution of first LED bulb (PI) which is same as the start date of the Grouped Project. **Evidence:** Distribution database	The start date of the new PAIs will be determined through the installation documents/9,27/ of the first unit disseminated under them which shall be after the start date of the grouped project. The condition has been set correctly in line VCS standard v4.4/3/.
12.	Be eligible for crediting from the start date of the instance through to the end of the project crediting period (only).	Each PI within this GP shall be eligible for crediting from its start date through to the end of the project crediting period (only).	Each project Instance is eligible for crediting from start date (first PI under grouped project), which is 15-07-2021 through to 14/07/2023 **Evidence:** Distribution	The start date of the project is 15/07/2021 (date of distribution of first LED bulb (PI) under the GP) which is same as the start date of the GP. The start date has been verified from the distribution database/9,27/.

			Database shared with VVB	Similarly, crediting start date for each future PI will also be verified from the project database.
13.	Only eligible for crediting from the start of the verification period in which they were added to the grouped project.	The new instances included to the Grouped project shall have a crediting period start date after the start date of the Verification period in which they are added.	The project instances added to the Grouped project have start date after the start of the Verification period i.e. after 15/07/2021.	The assessment team has checked the distribution records/9,27/ and carbon title transfer form/14/ and confirms that all new project instances have been installed on or after the start date of the verification period.
14.	Not be or have been enrolled in another VCS project.	The PP shall provide a Declaration that the Grouped project has not been enrolled and won't be enrolled as another VCS project	The Declaration has been provided to the VVB.	VVB has reviewed from the independent research as well as the declaration form/18/ and confirms that the project has not been enrolled in another VCS project.
15	Adhere to the clustering and capacity limit requirements for multiple project activity instances set out in 3.6.8 - 3.6.9.	The project should adhere to the clustering and capacity limit requirements for multiple project activity instances set out in 3.6.8 - 3.6.9.	The project has adhered to the requirement as explained below	The project has adhered to the clustering and capacity limits requirements which has been set in the VCS Standard v4.4/3/ and the assessment on the same has been provided below.

16	As per 3.6.8, The project proponent shall include in a singular project all project activity instances within ten kilometers of another instance of the same project activity and with the same project proponent (i.e., instances of the same project activity may not be spread across more than one project if they are within ten kilometers of each other).	The project proponent shall not register another Grouped project involving replacement of ICLs with LEDs, which has its instances within 10 km of the project instance from this GP	MEC has included all the project instances which are within 10km of each other in this Grouped project only. A Declaration has been submitted by PP to VVB to ensure PP doesn't add a similar Grouped project in future with Instances within 10 Km of this Grouped project's instances.	VVB has assessed the Declaration provided by the PP/47/ that it shall not register another Grouped project using same technology with instances within 10 km of the instances of this Grouped project.
17.	Where a capacity limit applies to a project activity included in the project, no project instance shall exceed such limit. Further, no single cluster of project activity instances shall exceed the capacity limit, determined as follows: • Each project activity instance that exceeds one percent of the capacity limit	The SSC capacity limit applies to the methodology AMS II.C used. However, as per para 15 of the Tool 19, Demonstration of additionality of microscale project activities version 10.0, "If each of the units contained in the CPA satisfies the condition to qualify as a 'microscale CDM unit', then the coordinating/man	The project has referred to an approved small-scale CDM methodology, AMS II.C. However, as per para 15 of the Tool 19, Demonstration of additionality of microscale project activities version 10.0, "If each of the units contained in the CPA satisfies the condition to qualify as a	The assessment team upon review of the manufacturer's specification/10/ and distribution records/27/ is of the opinion that the energy savings by each LED distributed in this GP is below 20 GWhe/y of the type II project micro-scale limits.

	shall be identified. • Such instances shall be divided into clusters, whereby each cluster is comprised of any system of instances such that each instance is within one kilometer of at least one other instance in the cluster. Instances that are not within one kilometer of any other instance shall not be assigned to clusters. None of the clusters shall exceed the capacity limit and no further project activity instances shall be added to the project that would cause any of the clusters to exceed the capacity limit.	aging entity is not required to demonstrate compliance of the CPA with the microscale or small-scale thresholds at the aggregate level of the CPA. In such cases, the requirements related to debundling stated in paragraph 6 above do not apply".	'microscale CDM unit', then the coordinating/managing entity is not required to demonstrate compliance of the CPA with the microscale or small-scale thresholds at the aggregate level of the CPA. In such cases, the requirements related to debundling stated in paragraph 6 above do not apply". As shown in the tab 'Emission Reduction' of the ex-ante emission reduction sheet the average savings of LED is 0.118 MWH/yr, therefore, it qualifies as microscale CDM unit (<20GWh/yr) and hence the project is not required to demonstrate	

			compliance with the microscale or small-scale thresholds at the aggregate level. **Evidence:** Manufacture specifications and distribution records	

Thus, VVB is of the opinion that the project activity batches meet all the required eligibility criteria to be included within the grouped project.

CAR 02 was raised and resolved.

- **Project proponent and other entities involved in the project**

  MicroEnergy Credits Corporation is the project proponent of the project, and no other entity is involved in this grouped project activity.

- **Ownership**

  MicroEnergy Credits Corporation is the sole owner of the carbon credits generated from the VCS grouped project activity titled "MicroEnergy Credits – Microfinance for Efficient Lighting Product Lines - India". The participating households have signed an End user agreement/14/ to confirm that the ownership rights of the carbon assets generated from this project lie with the implementing partners of the LEDs and the same was confirmed during the on-site visit/17/. Also, a legally binding MoU/31/ was also signed between the PP and the implementing partners of the LED stating that the ownership rights of the carbon assets generated from this project lie with the project proponent. Thus, the ownership is clearly established and correctly listed in the joint PD-MR/1/. VVB confirms that all the evidence demonstrating the ownership of the project or right to use were found to be acceptable. It was found to be in compliance with section 3.7.1 of VCS standard/3/. Independent research was conducted to confirm that the project is not listed under any emission trading program or other binding limits.

- **Project start date**

  The date of distribution of first LED has been considered as the start date of the grouped project activity, which took place on 15/07/2021, the same has been verified from the implementation database/9,27/. This is also confirmed as the start date of the grouped project activity and was found to be in compliance with section 3.8 of VCS standard/3/.

- **Project crediting period**

The project crediting period will be seven years, twice renewable, for a maximum total of 21 years. The first crediting period for the grouped project activity will be 15/07/2021 to 14/07/2028 (both days included).

- **Project scale and estimated GHG emission reductions or removals**

  The project activity is correctly classified as "project" as per VCS Standard para 3.10.1 as the average annual emission reductions are not more than 300,000 tCO_2e. The estimated average annual GHG emission reductions is 93,624 for project activity and the total emission reductions over the crediting period of 7 years is 655,371 tCO_2e for project activity. The estimated emission reductions are consistent with the corresponding ex-ante ER spreadsheet/8/.

- **Project location**

  The project location is India, and all the project activity instances will be implemented within the boundaries of India. The project boundary for each Project Activity Batch is the physical, geographical location of the LED distributed within the host country which was verified from the distribution database/27/ and during the on-site visit/17/. The geographical coordinates of the project sites were verified at the time of monitoring survey samples during VVB on-site visit/17/. Get-geocoordinates mobile application was used to check the geographical coordinates for the samples visited on-site which was found to be consistent defining the project location as the geographical boundaries of the host country, India. Therefore, this was found to be acceptable by the VVB.

- **Conditions prior to project initiation**

  The condition prevalent prior to the project activity is the widespread use of the ICLs, due to their lower costs which was verified during the on-site visit/17/ and from the baseline survey database/12/ and interviews/17/.

- **Project compliance with applicable laws, statutes and other regulatory frameworks**

  There are no mandatory policies and/or regulations in the host country that mandates distribution and/or installation of LED lighting equipment in households. Thus, there are no rules or regulations in the host country India for implementation of the PIs. The same has been verified by the assessment team through independent research. Further, in line with Solid Waste Management Rules/19/, all collected ICLs (baseline lamps) from the households will be recycled by the assigned contractor, as confirmed from the signed agreement between the project implementer and the contractor/15/. The signed agreement requires all components of the destroyed ICLs to be recycled at a dedicated facility.

- **Participation under other GHG programs:**

  - **Projects registered (or seeking registration) under other GHG program(s)**

The validation team has verified that the grouped project activity has not been registered, and it has no plans to register under any other GHG program by reviewing the declaration from the PP that the project has not claimed or will not claim carbon credits under any other scheme after registration of the proposes project under VCS/18/. The same has been confirmed by the VVB through review of the registries of various GHG programs including CDM, GS4GG and GCC.

- **Rejection by other GHG programs**

The project has not been registered by any other GHG programs/18/. The same has been confirmed by the VVB through review of the registries of various GHG programs including CDM, GS4GG and GCC.

- **Other forms of credit and supply chain (Scope 3) emissions:**
  - **Emissions trading programs and other binding limits**

The PP confirms in section 1.16.1 of the joint PD-MR /1/ that this grouped project does not reduce GHG emissions from activities that are included in an emissions trading program. India does not have its own ETS. Also, it does not seek or receive another form of GHG-related environmental credit.

  - **Other forms of environmental credit sought or received and eligible to be sought or received**

The grouped project activity did not seek or receive another form of GHG-related environmental credit.

  - **Issuance of public statement(s) to help prevent Scope 3 emissions double claiming**

The grouped project activity which aims at distribution of LED to households does not result in any Scope 3 emissions in its supply chain.

  - **Email notification of the potential risk of Scope 3 emissions double claiming**

The grouped project activity does not result in any Scope 3 emissions, hence not appliable.

- **Additional information relevant to the project, including:**
  - **Leakage management for AFOLU projects**

As the grouped project activity does not involve transfer of LEDs from some other activity for leakage, this is not applicable.

  - **Commercially sensitive information**

The VCS joint PD-MR/1/ does not indicate any information that is commercially sensitive in nature as confirmed by PP under section 1.18 of joint PD-MR/1/.

- **Sustainable development contributions**

Indicator	Description
Environmental Sustainability	The project lamps result in reduced consumption of electricity, thereby resulting in lesser GHGs emissions, the same is verified from the manufacturer's specification/10/ and the ER sheets/16/. The project lamps do not contain mercury thereby reducing the release of toxic heavy metal into the environment. Thereby the VVB is of the opinion that the project activity supports environmental sustainability.
Social Sustainability	The project lamps have received a positive response from the end-user as verified during the on-site audit/17/.
Economic Sustainability	The project activity will lead to local employment generation, thereby increasing income of households. The project activity also increases household saving due to reduced electricity consumption.
Technological Sustainability	The LED lamps distributed under the project activity is a relatively efficient technology then the ICLs being replaced, thereby providing subsidized access to better technology.

In VVB's opinion, the description of the group project is found to be justified as the joint PD-MR/1/ clearly describes and demonstrates compliance with all the criteria provided under the VCS standard/3/ and the applied methodology/5/. All the parameters are assessed under the light of the evidence provided by the PP and are found to be correct and consistent between the documents.

The project activity is contributing to 3 SDGs for the grouped project activity which are:

SDG 7 Affordable and Clean Energy - Indicator 7.1.2 Proportion of population with primary reliance on clean fuels and technology. In the current monitoring period, 331,724 and 691,255 number of LEDs are operational under MP1st year and MP-2nd year respectively of the project activity and this was confirmed from the distribution database/27/.

SDG 8 Decent Work and Economic Growth – Indicator 8 Employment generated for lifetime maintaining the project activity. In the current monitoring period, the project

activity provided informal employment to around 20 people, and this was confirmed from the employment records/13/.

SDG 13 Climate Action - Indicator 13 Tonnes of greenhouse gas emissions avoided or removed. During the current monitoring period, total GHG emission reductions for project activity are 48,430 tCO_2e and this was confirmed from the ER calculation sheet/16/.

All the SDGs listed in the joint PD-MR/1/ have been assessed by the VVB thoroughly by desk review and also cross checked during the on-site visit/17/ done by VVB. CAR 03 and CAR 04 were raised and resolved.

No further information is included in the VCS Joint PD-MR/1/. This is to confirm that the information in the project description is accurate, complete, and provides an understanding of the nature of the project.

3.2 Participation under Other GHG Programs

The grouped project activity has not been registered, and it has no plans to register under any other GHG program. The validation team has verified by reviewing the declaration from the PP that the project has not claimed or will not claim carbon credits under any other scheme after registration of the project under VCS/18/. Therefore, the grouped project activity is in line with section 3.22.1 of VCS standard/3/ and is eligible to participate under the VCS Program.

3.3 Safeguards

3.3.1 No Net Harm

The assessment team confirms that the project does not pose any potential negative environmental and socio-economic impacts. A local stakeholders meeting was conducted for the project and there was no negative feedback. The same has been confirmed by the interview of various stakeholders during the on-site audit/17/. The project activity does not come under purview of Environmental Impact Assessment and therefore no adverse impacts are envisaged. Therefore, no mitigation measures are required.

Every additional project activity instance to be added to this GP will summarize any potential negative environmental and socio-economic impacts and the steps taken to mitigate them.

3.3.2 Local Stakeholder Consultation

The local stakeholder consultation was conducted on 11/02/2023 as physical meeting as well as virtual meeting in 22 states of India. The assessment team has found the conformance of the procedure and method of engagement to be as per VCS guidelines v4.3 /2/. The assessment team has verified the input through interviews with the local stakeholders and thus confirmed that no negative comments were received for the project as described under section 2.3 of this

report. The interviews conducted by the assessment team were also conducted as a means of confirmation of the meeting invitation and meeting location, which were found to be accurately reported in the joint PD-MR/1/. This was further cross-checked with the meeting invitations/35/ and attendance sheet/36/ reviewed by the assessment team and found consistent.

A continuous grievance mechanism has been established and local stakeholders have confirmed that it was described during the meeting as well as the contact of the local partner/37/ and google link was shared with them where they can register their grievances, thus establishing a continuous grievance mechanism in conformance to the VCS guidelines/2/. Evidence on the collection of grievance feedback from the end-users/37/ was provided (photographs of the grievance logbook sample and feedback forms) by the PP, and the requirement is identified being fulfilled during the VVB on-site audit/17/.

CL 01 was raised and resolved.

3.3.3 Environmental Impact

The PIs under this GP does not fall in the list of projects or activities requiring environmental impact assessment as it falls under exemption by the regulations of the host country. The project activity is therefore envisaged as no negative impact activity.

3.3.4 Public Comments

This project was open for public comment from 12/05/2023 to 11/06/2023. No comments were received by the project during the public comment period as confirmed from the project registry webpage /32/.

3.3.5 AFOLU-Specific Safeguards

This project is a non-AFOLU project type; therefore, this section is not required.

3.4 Application of Methodology

3.4.1 Title and Reference

The project, as given in the section 3.1 of VCS Joint PD-MR /1/, has applied CDM approved methodology: AMS.II.C. “Demand-side energy efficiency activities for specific technologies, version 15.0/5/ and relevant tools prescribed therein. The reference to the versions of the tools and methodology were found to be valid for use. The validity of the versions of the applied methodology and tools were checked from the CDM website/38/.

The tools referred in this project are listed below:

- Methodology: AMS-I. D: Grid connected renewable electricity generation; Version 18.0/20/
- Standard: VCS Standard, v4.4/3/

- Methodological TOOL19 "Demonstration of additionality of microscale project activities" Version 10.0/46/
- Methodological tool 21: Demonstration of additionality of smallscale project activities version 13.1 /21/
- Guideline: General guidelines for SSC CDM methodologies, version 23.1/25/
- Guidelines for "Sampling and surveys of CDM project activities and programmes of activities" version 4.0/6/
- Methodological TOOL07 "Tool to calculate the emission factor for an electricity system", version 7.0/22/
- Tool 10: Methodological tool to determine the remaining lifetime of equipment, version 01/24/
- Tool 1: Tool for demonstration and assessment of additionality, version 07.0/23/

The above-mentioned methodology and tools as described in the joint PD-MR/1/ are found to be correctly listed and latest available version is being applied during the validation of the GP.

3.4.2 Applicability

The project "MicroEnergy Credits – Microfinance for Efficient Lighting Product Lines - India" complies with each applicability condition of the identified methodology /5/. The same has been justified in the following table.

As per para 3.8.1. of VCS standard/3/, non-AFOLU projects shall complete validation within two years of the project start date. Since the project start date was determined to be 15/07/2021. The validation can be completed within 2 years i.e., by 14/07/2023. It shall be noted that the project applies the latest version of the methodology/5/.

Applicability criteria of applied methodology, AMS.II.C. "Demand-side energy efficiency activities for specific technologies, version 15.0/5/ for PIs to be included are listed in the table below:

No.	Applicability Condition	How the Project instance comply and Evidence	Means of assessment
1.	This methodology is only applicable if the service level (e.g. rated capacity or output) of the installed, project energy-efficient equipment is between 90% and 150% of the service	The PIs under the grouped project will replace existing incandescent lamp (ICL) i.e., 60W and 70W with similar output LED lamps i.e., 9W LED and 12W LED respectively. As shown under worksheet 'Service	The assessment team has reviewed the manufacturer's specifications/10/ and Service level configuration tab in ex-ante ER calculation sheet/8/ provided by the PP and the

	level of the baseline equipment.	Level Configuration' of the ex-ante ER calculation sheet the Service level is between 90% and 150%. However, as per criteria 7 of this table since the total light output of a project lamp should be equal to or more than that of the baseline lamp being replaced, only Service level between 100% and 150% shall be considered. Therefore, the baseline lamps of wattage 60W are replaced against 9W LED and 70W getting replaced with 12W LED which meets methodology service level requirements. **Evidence:** Manufacturer's specification and Service level configuration tab in ER calculation sheet presented for the grouped project.	on-site audit/17/ confirms that the project LED will replace the existing ICLs, and they are within the service level specifications of the baseline lamps. Therefore, this criterion requirement is met.
2.	Requirements pertaining to the baseline of the retrofit projects and projects involving capacity increase are indicated in paragraphs 20 to 21 in the above cited general guidelines to SSC CDM methodologies.	The project instance is retrofit of LEDs in rural households of India. The project will follow the requirements pertaining to baseline in para 20-21 of the SSC CDM meth v23.1 for all instances included to GP. **Evidence:** ER calculation sheet	The project instances under the GP are following the required SSC CDM guidelines/25/ and the same has been verified from section 1.11 of the joint PD-MR/1/. As per para 20 of the SSC Guidelines/25/; the project needs to achieve the same output as baseline or otherwise as

			mentioned in the methodology. Since the methodology refers to meeting service level between 90% to 150% for the energy efficient lamps, the JPD-MR has mentioned clearly that the project is meeting the limit defined by the methodology and the same has been verified from the 'Service level configuration' worksheet of the ex-ante ER sheet/8/ and found to be appropriate. These calculations are extensively discussed under section 3.4.6 of this report. Therefore, this criterion requirement is met.
3.	If the energy-efficient equipment contains refrigerants, then the refrigerant used in the project case shall have no ozone depleting potential (ODP).	The project does not involve equipment that contains refrigerants. **Evidence:** Manufacturer's specification	It has been verified from the manufacturer's specifications/10/ that the LEDs does not contain any refrigerants. Therefore, this criterion requirement is met.
4.	This methodology credits emission reductions only due to the reduction in electricity and/or fossil fuel consumption from use of more efficient equipment. However, the calculation of project emissions shall include any incremental emissions, as compared to	The PIs developed under present GP shall claim emission reductions only due to the reduction in electricity consumption from use of more efficient lighting equipment. As there are no refrigerants involved, incremental emissions associated with	As there are no refrigerants used, the emission reduction of electricity consumption and the same is correctly described in the joint PD-MR/1/ and the ex-ante ER sheet/8/.

	the baseline, associated with refrigerants used in the project equipment.	refrigerants is not applicable. **Evidence:** Manufacturer's specification and ER calculation sheet.	Therefore, this criterion requirement is met.
5.	The aggregate energy savings by a single project may not exceed the equivalent of 60 GWh per year for electrical end-use energy efficiency technologies. For fossil fuel end-use energy efficient technologies, the limit is 180 GWh thermal per year in fuel input.	The project has referred to an approved small-scale CDM methodology, AMS II.C. As per para 15 of the Tool 19, Demonstration of additionality of microscale project activities version 10.0, "If each of the units contained in the CPA satisfies the condition to qualify as a 'microscale CDM unit', then the coordinating/managing entity is not required to demonstrate compliance of the CPA with the microscale or small-scale thresholds at the aggregate level of the CPA. In such cases, the requirements related to debundling stated in paragraph 6 above do not apply". As shown in the tab 'Emission Reduction' of the ex-ante emission reduction sheet the average savings of LED is 0.118 MWH/yr, therefore, it qualifies as microscale CDM unit (<20GWh/yr) and hence the project is not required to demonstrate compliance with the microscale or	The grouped project has the average energy savings of LED of 0.118 MWh/yr which is below 20 GWh/yr of the type II project micro scale limits as verified from the Ex-ante Emission Reduction Sheet/8/, manufacturer's specifications/10/ and distribution records/9,27/ and therefore qualifies as microscale CDM unit. Therefore, this criterion requirement is met.

		small-scale thresholds at the aggregate level. **Evidence:** Manufacture's specification and distribution records and ER calculation spreadsheet.	
6.	For both residential and commercial applications, the project shall explain the proposed method of distribution of project lamps and how collection (e.g. exchanged for project lamps) and destruction of baseline lamps will be conducted and documented.	The Project activity shall involve distribution of the LED to only those households which exchange old ICLs and will be subsequently destructed. Agreement with collection and distribution agency or any other document/ time stamped video etc. to demonstrate compliance with this applicability criteria. **Evidence:** Distribution database and interview of households with VVB confirming replacement of equivalent ICLs with LED. Contract between project proponent and ICL destruction agency. A time stamped video of the destruction event, from the agency hired for collection, destruction, and recycling.	The ICLs are being displaced by the PP itself and as witnessed through the distribution activity/27/ that the replaced bulbs were collected and separately packed for destruction. ICLs bulbs will be destroyed by the agency contracted for this purpose. The contracted agency/15/ will destroy the ICLs and provide a time stamped video of the event of destruction. PP also has a contract/15/ with the LED manufacturing unit which will prevent the double counting of the units distributed in this project. The double counting elimination procedures are appropriately described under the section 6.3 of the joint PD-MR/1/. PP has also provided the declaration/18/ and same was verified from the

			carbon waiver forms/14,31/. Therefore, this criterion requirement is met.
7.	The total light output of a project lamp should be equal to or more than that of the baseline lamp being replaced; light output of the baseline and the project lamp shall be determined in accordance with relevant national or international standard/s.	The PI is a 9W & 12W LEDs. The total light output of project lamp is more than that of baseline lamps. The light output of project lamp as per manufacturer's specification and for baseline lamps values provided in table 2 of the methodology AMS II.C has been used. Also, the grouped project has replaced the baseline lamps of wattages 60 W (715 ln) with similar output LED lamp of 9W LED and the baseline lamp of wattage 70W (865 ln) has been replaced with 12W LED which meets methodology service level requirement. **Evidence:** Manufacturer's specifications which comply with BEE standard are used for lighting output and Wattage of LED bulbs	PIs are 9W LEDs and 12W LEDs to replace 60W and 70W ICLs respectively. As shown in section 3.1 of this report, the total light output of the project lamps is more than the baseline lamps which was confirmed from the manufacturer's specifications/10/. Therefore, this criterion requirement is met.
8.	The rated average life of each project lamp type shall be known ex ante and reported. Manufacturer specifications shall be used to determine the rated average life. The project	The rated average lifetime of the project lamp (9W and 12W) distributed under grouped Project is 25,000 hrs.	The rated average lifetime of the project lamp distributed under the Grouped Project as described in the joint PD-MR/1/ is:

	shall cite the standard used by the manufacturer.	The standard used by the manufacturer for determining rated average life of both types of project lamps is the relevant BIS standard. **Evidence:** Manufacturer's specifications provide evidence of rated average life of project lamps.	9W lamp – 25,0000 hrs 12W lamp – 25,000 hrs The same has been verified through the relevant BIS standard and the manufacturer's specifications/10/. Therefore, this criterion requirement is met.
9.	The project lamps utilized under the project activity shall, in addition to the standard lamp specifications, be marked for clear unique identification for the project. The method to meet this requirement includes, but is not limited to, the following: (a) Permanent marking of project number and name on each of the project lamps along with other specifications; (b) Marking using special codes, for example each project is permanently marked 'for CDM project, not for sale/resale' followed by project specific marking/labelling; (c) Other forms of identification using communication technologies (e.g. GPS, mobile phone networks) or lease/rental payment	Each recipient of LED will be identified by a specific geographical location, customer name and contact details. The project Manager will maintain this database with complete details such as name of the customer, address/ description of location, Adhaar card details and contact telephone number(s). This will help in identifying unambiguously the recipient of new equipment distributed under the project activity. In addition, as required by the applied methodology, each of the LEDs distributed under this GP shall be marked with a logo designed by PP for unique identification. **Evidence:** Photo of LED with above specifications and distribution database	The LEDs distributed have been marked by the unique logo and the same has been verified during the on-site audit/17/ and the photographs of bulbs with markings shared by the PP/29/. There is a badging of "NOT FOR RESALE", hence these units cannot be sold to any other retailer for the profit. Therefore, this criterion requirement is met.

10.	The project activity shall be designed to limit undesired secondary market effects (e.g. leakage) and free riders by ensuring that replaced lamps are collected and destroyed. Further project participants are required to undertake at least one of the following actions: (a) Directly installing the project lamps; (b) Charging a market price on a weekly/monthly basis for efficient lighting equipment; (c) Restricting the number of lamps per household distributed through the project activity to six.	To make sure that the replaced lamps are collected and destroyed steps as per criteria 6 of this table will be followed. The Project participants is undertaking all point (a), (b), (c). a) The PP is directly installing the project LEDs and collecting replaced ICLs b) The MFIs are providing the LEDs at market price on monthly loan to end users c) The number of lamps have been restricted to six per household **Evidence:** Agreement with agency responsible for collection, destruction and recycling of baseline lamps.	The project activity ensures the direct installation and collection of the ICLs, the same has been verified through the on-site audit/17/. During the project activity the collected lamps will be destroyed by the contracted agency/15/. The number of LEDs distributed are also found restricted to maximum 6 per HH. Therefore, this criterion requirement is met.
11.	The households receiving project lamps are connected to a national or regional electricity grid.	The region where the LEDs are distributed have grid connectivity. Further, LEDs are distributed only to those HHs which have an electricity meter installed. **Evidence:** Distribution database.	The assessment team during the on-site audit/17/ and interviews with the PP established that the HHs have an electricity meter installed. Therefore, this criterion requirement is met.
12.	The CDM-PDD or CDM-PoA-DD/CPA-DD shall also explain how the proposed procedures eliminate double counting of	MEC has signed agreements with all MFIs which are distributing the LEDs to end users under grouped project. Also	PP has a contract/15/ with the LED manufacturing unit which will prevent the double counting of the units

	emission reductions, for example due to project lamp manufacturers, wholesale providers or others possibly claiming credit for emission reductions from the project lamps	these MFIs sign carbon title transfer forms with the end users. Also, under grouped project activity MFIs has signed agreements with the manufacturers of the LEDs waiving of any rights on the carbon credits and not to claim ERs under any other program. **Evidence:** Agreement between MEC and MFIs, MFIs and manufacturers and carbon title transfer forms by end users	distributed in this project. The double counting elimination procedures are appropriately described under section 6.3 of the joint PD-MR/1/. PP has also provided the declaration/18/ and the same was verified from the carbon waiver forms/14/. Therefore, this criterion requirement is met.

Applicability criteria of applied tool, TOOL 21 "Demonstration of additionality of small-scale project activities, version 13.1/21/ for PAIs to be included are listed in the table below:

No.	Applicability Condition	How the Project instance comply and Evidence	Means of assessment
1.	The use of the methodological tool "Demonstration of additionality of small-scale project activities" is not mandatory for project participants when proposing new methodologies. Project participants and coordinating/managing entities may propose alternative methods to demonstrate additionality for consideration by the Executive Board	The grouped project involves applying existing small-scale methodology AMS.II.C and uses the tool for demonstrating additionality in section B.5. **Evidence:** Investment analysis sheet submitted to VVB	The assessment team has reviewed the Investment analysis sheet /33/ provided by the PP and confirms that the grouped project activity has applied TOOL 21 for demonstrating additionality of the group project activity. Therefore, this criterion requirement is met.
2.	Project participants and coordinating/managing	PP has demonstrated additionality using	The assessment team has reviewed the Investment

	entities may also apply "TOOL19: Demonstration of additionality of microscale project activities" as applicable.	Appendix of Tool 21 where it is considered the size of units <=20GWh and has therefore also applied Tool 19. **Evidence:** Investment analysis sheet as per "Tool for demonstration of additionality" submitted to VVB	analysis sheet /33/ provided by the PP and confirms that the grouped project activity has applied TOOL 21 and TOOL 19 for demonstrating additionality of the grouped project activity. Therefore, this criterion requirement is met.

Applicability criteria of applied tool, TOOL 10: Methodological tool to determine the remaining lifetime of equipment, version 1.0/24/ for PAIs to be included are listed in the table below:

No.	Applicability Condition	How the Project instance comply and Evidence	Means of assessment
1.	Methodologies referring to this tool should clearly specify for which equipment the remaining lifetime should be determined. The remaining lifetime of relevant equipment shall be determined prior to the implementation of the project activity. Project participants using this tool shall document transparently in the CDM-PDD how the remaining lifetime of applicable equipment has been determined, including (references to) all documentation used.	The grouped project involves distribution of LEDs to households and the applicability of this tool has been demonstrated in section 3.2 of this document. **Evidence:** Section 3.2 of this document and literature references provided to VVB	The assessment team has reviewed section 3.2 of the joint PD-MR and the reference links provided under it and confirms that the PP has determined the remaining lifetime of the group project activity by using this methodological tool/24/ which was found to be appropriate. Therefore, this criterion requirement is met.
2.	Under this tool, impacts on the lifetime of the equipment due to policies and regulations (e.g. environmental regulations)	PP has demonstrated and applied this tool in section 3.4 of this document.	The assessment team has reviewed section 3.4 of the joint PD-MR and the reference links provided under it and confirms that

	or changes in the services needed (e.g. increased energy demand) are not considered. Methodologies referring to this tool shall, where applicable, provide specific guidance on how regulations that warrant the replacement of the equipment before it has reached the end of its technical lifetime should be addressed.	**Evidence:** Section 3.4 of this document and literature references provided to VVB	the PP has determined the remaining lifetime of the group project activity by using this methodological tool/24/ which was found to be appropriate. Therefore, this criterion requirement is met.

Applicability criteria of applied tool, Tool 7: Tool to calculate the emission factor for an electricity system, version 1.0/22/ for PAIs to be included are listed in the table below:

No.	Applicability Condition	How the Project instance comply and Evidence	Means of assessment
1.	This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).	The grouped project involves replacement of ICLs with LEDs resulting in energy savings. The tool has not been used directly for CM calculations but has used CEA database for CO2 baseline emission factor which uses this tool. **Evidence:** The CEA database version 18.0 has been shared with the VVB	The assessment team has reviewed the CEA database/26/ which has been used by the group project activity for determining the CO2 baseline emission factor which has used this tool for calculations and the value applied was found to be appropriate. Therefore, this criterion requirement is met.
2.	Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the	The CEA database version 18.0 uses the Tool 07 to calculate the CO2 baseline emission factor. **Evidence:** The CEA database version 18.0 has been shared with the VVB	The assessment team has reviewed the CEA database/26/ which has been used by the group project activity for determining the CO2 baseline emission factor

	latter case, two sub-options under the step 2 of the tool are available to the project participants, i.e. option IIa and option IIb. If option IIa is chosen, the conditions specified in "Appendix 1: Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity		which has used this tool for calculations and the value applied was found to be appropriate. Therefore, this criterion requirement is met.
3.	In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	The project is not located in Annex 1 Country.	The host country is India which is a non-Annex I country which has been confirmed from the UNFCCC website non-Annex country list.
4.	Under this tool, the value applied to the CO2 emission factor of biofuels is zero	The grouped project involves replacement of ICLs with LEDs resulting in energy savings.	It has been confirmed from the sales database/27/ that the grouped project activity

		Evidence: Sales database	involves replacement of ICLs with LEDs which results in energy savings which can also be confirmed from the ex-ante ER sheet/8/.

The validation team confirms that the project activity meets the criteria of the applied methodology, the tools applied have been correctly chosen and this has been appropriately described in the joint PD-MR/1/. CAR 05 was raised and resolved.

3.4.3 Project Boundary

The project boundary for the GP consists of the physical, geographical locations of the distributed LEDs limited within the geographic boundary of India. The boundary includes LEDs distributed to grid connected rural households for domestic lighting usage. The same has been verified from the electricity meter, number of beneficiaries and the GPS coordinates of the distribution database/27/.

The sources of greenhouse gas emissions identified in the joint PD-MR/1/ are deemed to be appropriate and assessed with respect to the applied methodology/5/.

3.4.4 Baseline Scenario

In absence of project activity, there is a significant likelihood of the continued use of ICLs, which although inefficient, find high acceptance due to their lower costs. The respondents during the interviews confirmed that the on an average an ICL costed between 10-15 INR per bulb whereas the LED were costlier with the prices going up to 100-150 INR per bulb/17/.

The assessment team has considered the prevailing market price for both the devices and through independent checks is of the opinion that higher costs of efficient bulbs worked as negative deterrent in the adaptation. The same situation in the baseline is further established by PP through the baseline survey which reflects predominant usage ICLs in baseline households.

The National Mission on Enhanced Energy Efficiency (NMEEE) in 2009/39/ and the Energy Conservation Act, 2001 promotes activities undertaking energy efficiency measures, however there are no regulations or requirements in the host country mandating the installation or usage of LED lighting technology. Therefore, there are no regulatory constraints.

Therefore, the baseline scenario has been appropriately described under the section 3.4 of the joint PD-MR/1/ and the baseline conditions are verified by the VVB through end-user interviews/17/.

Following the guidance in Guidelines for Sampling and Surveys for CDM Project activities and Programme of Activities Ver. 4.0/6/, which was found to be appropriately applied for sample size determination of baseline surveys, PP conducted surveys of 2300 households from across 23

states. As per the para 51 of the applied methodology, the baseline scenario is the use of the in-efficient ICLs, which can be clearly seen from the results of the survey which was conducted by the PP/17/ and further confirmed during the on-site visit/17/. Also, the baseline scenario for the inverter component is use of kerosene lamps during power cut offs which is verified from the baseline surveys/12/ and site visit/17/. VVB has verified from an independent ER calculation sheet for this component using the latest version of the methodology, AMS III AR submitted by PP, baseline surveys and interviews during on-site visit which confirms the inverter component results in emission reductions, however, PP is not claiming these to avoid monitoring costs and use of additional methodology. However, PP is not claiming any ERs for the inverter component of the LED. Thus, the baseline was established.

3.4.5 Additionality

To demonstrate the additionality of the GP as described in the joint PD-MR/1/, the project is following Methodological Tool 21: Demonstration of additionality of small-scale project activities version 13.1/21/ to prove project's additionality using Investment barrier.

This approach is different from the one mentioned in section 5.2 of the applied methodology, which allows LED lamp distribution projects under this methodology to be considered automatically additional, the condition being no more applicable since 27th November 2017. No updates from CDM EB were found in this regard. In absence of any alternate provision available under the applied methodology, application of Methodological Tool 21: Demonstration of additionality of small-scale project activities version 13.1/21/ and Tool 19: Demonstration of additionality of microscale project activities version 10.0/19/ are found to be appropriate and in line with CDM and VCS standards.

Variable	Value	MOV
Sale price of 9W LED	$5.33 - $9.13	MRP of each LED has been verified from the weblinks and photographs of the product packaging shared by the PP/51/.
Sale price of 12W LED	$15.93	
Procurement Cost of LED		
Purchase cost of 9W LED	$4.80 - $7.33	The validation team has checked the opted values for 9W and 12W LEDs and found conformance with the purchase order and invoice/34/ generated after the first purchase.
Purchase cost of 12W LED	$10.00	
Total Origination Cost	$289,600	The validation team has checked the total origination cost to be $289,600 which was confirmed from various

		evidence like purchase receipt of run time meters/34/ which confirms the cost of LED run time meters. The VVB cost was verified from the signed contract/34/, the travel cost for monitoring and audit was verified from the travel expense summary sheet/34/, the monitoring technical team consultant cost was verified from the signed agreement and contract/34/ which was found to be appropriate.
Discount Rate	12.25%	The validation team has verified the discount rate to be 12.25% since the investment decision was made in June 2021 as confirmed from the letter of intent submitted by MEC to MFIs/50/. The value of the discount rate was confirmed from the Historical data of SBI which represents the 'Benchmark Prime Lending Rate'/45/ which consists of the same discount rate of 12.25%. The project proponent has provided the reference link of the same in the IRR sheet.
Inflation rate	6.60%	The validation team has verified the inflation rate to be 6.60% which was confirmed from the World Bank data/49/ for the year 2021 which is the latest data for India.

To demonstrate the investment barrier, PP has provided the IRR sheet/33/ as the LEDs are distributed on loan-based scheme for financing the LEDs, but the payment made by the customer is in instalments, at no interest. There is a cost involved in the purchase of LEDs (9W and 12W). Further, as per the Agreement between MFI and End user/42/, the MFI gives loan on 100% of the MRP of the LED where the repayment starts after 2-6 months of the loan. The loan is generally repaid in monthly instalments within a year. PP has therefore now considered an average 75% revenue from sale of LEDs in 1st year and rest 25% is payable in next year as the sales are made throughout the year. Other costs incurred involves the operations cost which includes internal capacity building, marketing and client education etc. and technical assistance cost.

VVB further confirms that the PP has included the information related to carbon pricing and it has been found that the carbon pricing is based on the Emission Reduction purchase Agreement/48/ signed with the buyer by MEC around the Investment decision time which was confirmed from the copy of the buyer agreement by MEC and thus found to be appropriate. VVB has verified from the Historical data of SBI/45/ which represents the 'Benchmark Prime Lending Rate' which consists of the same discount rate of 12.25% applicable for 2nd quarter of 2021. The project proponent has provided the reference link of the same in the IRR sheet.

The cash flow of year 0 is typically negative because it represents the initial investment required to start a project or make an investment. This initial investment is an upfront cost to initiate the project. The cash flow at year 0 is considered an outflow, and in financial terms, it is represented as a negative value. From year 1 onwards, the cash flows are expected to be positive because they represent the returns or benefits generated by the project or investment. These positive cash flows could come from various sources such as sales revenue, cost savings, or other income streams associated with the project.

The IRR sheet/33/ has been reviewed by the VVB and found that the model has been considered from Year 1 now and it has been considered that the PP starts getting revenue from LED sale from 2-6 month onwards only therefore the revenue has been considered at 75% in first year and 25% is added to next year and similar accounting is followed for further years. PP has calculated NPV of the project activity instances. The validation team checked all the input values (cash inflow and cash outflow) opted for NPV calculation with their respective evidence/34/ and found it appropriate. The key cash outflow assumption has been verified through purchase orders and invoices/34/.

VVB has reviewed the NPV calculation in the IRR sheet and confirms that cash flows are appropriately accounted in the investment analysis. The financial calculations have been verified and found appropriate. Since the revenue obtained from the sale of LEDs to the end users is very low, hence PP is seeking for the carbon revenue to meet the financial liabilities involved in this project.

The validation team after a thorough assessment has found it appropriate and in agreement with the applied methodology.

The financial calculations have been checked and verified and deemed appropriate. It is clearly established that the Grouped project has negative NPV.

Therefore, the validation team confirms that the Project activity is additional, and all the project activity instances that have been included in the GP meets the eligibility criteria.

CL 04 was raised and resolved.

3.4.6 Quantification of GHG Emission Reductions and Removals

The project applies the CDM methodology AMS-II.C: Demand-side energy efficiency activities for specific technologies, v15.0/5/. All the parameters considered for calculation of emission reductions are correctly applied by the PP.

Data and Parameters fixed ex-ante:

S.No.	Parameter	Value applied	Means of assessment
1.	$EF_{CO2,ELEC,y}$ Combined margin emission factor for Indian grid	0.915 tCO_2/MWh	The value has been verified from the CO_2 Baseline Database for the Indian Power Sector, User Guide; version 18.0 dated September 2022/40/ and is found to be appropriate. The description, justification and source are in accordance with the applied methodology/5/. The value applied is found to be appropriate and consistent with the ex-ante ER sheet/8/.
2.	l_i Rated average operating hours for LED type i	25,000 hrs	The rated operating hours are verified from the manufacturer's specification/10/. The description, justification and source are in accordance with the applied methodology/5/.
3.	$\rho_{i, baseline (XW)}$ Rated power of baseline lamps replaced	60W, 70W	The replacement activity is undertaken by the PP and the nameplate data of wattage is recorded for each replaced lamp. The value is sourced from primary data collected from households i.e., baseline surveys data/12/. The value for the parameter is found to be consistent across the joint PD-MR/1/ and ex-ante ER sheet/8/.
4.	$\rho_{i, p (YW)}$ Rated power of project lamps	9W, 12W	The rated power of the project lamps is verified from the manufacturer's specification/10/ and is found to be consistent across the joint PD-MR/1/ and ex-ante ER sheet/8/.

			The description, justification and source are in accordance with the applied methodology/5/.
5.	l_y Average annual technical grid losses	0.10	The parameter describes average annual technical grid losses. According to section 5.4.1.1 of the applied methodology, para 22 states that the default value 0.10 can be used if no recent data are available or the data cannot be regarded accurate and reliable. The data made publicly available by Central Electricity Authority of India/40/ was reviewed to confirm the technical grid losses. The document states that the electricity lost in transformation, transmission and distribution is 20.46%, which also includes unaccounted electricity. Similar information was released by Ministry of Energy through Press Bureau of India, with aggregate Technical and Commercial Losses reported as 20.93% /39/. However, there is no publicly available data that provides the data on transmission losses separately from non-technical/ commercial losses (as required by the applied methodology). Therefore, due to lack of credible sources with relevant data, and considering that the methodology default value (0.10) will result in comparatively more conservative emission reduction estimates, PP's approach to consider the methodology default value has been found acceptable. The description, justification and source are in accordance with applied

			methodology. The value applied found to be appropriate and consistent with ex-ante ER sheet/8/.

Data and Parameters to be monitored:

S.No.	Parameter	Monitoring frequency	Means of assessment
1.	$n_{i, b (XW)}$ Number of baseline lamps of X wattage replaced.	Annual or at the time of monitoring	The ex-ante value of 134,983 for year 2021, 577,734 for year 2022 and 968,782 for year 2023 to 2028 has been used for 60W ICL replaced whereas 2,042 for year 2022 and 10,000 for year 2023 to 2028 has been used for 70W ICL replaced under the project activity. Ex-post actual ICL collected value shall be updated before first verification. During the time of exchange of baseline lamps record will be kept of the number of replaced lamps. Data will be collected via smart phone connected to cloud. The parameter determination approach is found acceptable and justified.
2.	$n_{i \text{ baseline scrapped } (XW)}$ Number of baseline lamps of X wattage destroyed	Annual	At the time of the exchange of baseline lamps a record will be kept of the number of replaced lamps. The same has to be verified during the first verification. The source of parameter is database record on baseline lamps handed over to third party that is responsible for destruction of ICLs/15/. The destruction will also be documented via time stamped video records. For the project activity the ex-ante value for this parameter has been taken as 134,983 for year 2021, 577,734 for year 2022 and 968,782 for year 2023 to 2028 has been used

			for 60W ICL destroyed whereas 2,042 for year 2022 and 10,000 for year 2023 to 2028 has been used for 70W ICL destroyed. The parameter determination approach is found acceptable and justified.
3.	O_i Average annual operating hours of XW baseline lamp	Once during the crediting period	The parameter indicates the average annual operating hours of baseline lamps. It will be recorded once for the entire crediting period in line with applied methodology. The value of average annual operating hours of baseline lamp will be measured continuously for a period of 90 days with the help of run time meters installed on a sample of lighting points. The approach for determining this parameter is in line with applied methodology and will be verifiable through field tests records. Sampling for the parameter will be conducted in line with guidelines for Sampling and surveys for CDM project activities and programme of activities, version 04/6/ as confirmed from the monitoring plan. This value shall be adjusted to account for seasonal variations. The value used for ex-ante estimates has been cross checked with the pilot study records /41/. The value has been found to be correct, justified and consistent.
4.	$N_{i,\ project,\ operational\ (YW)}$ Total number of project lamps of Y wattage that are operational	Annual	The parameter sample will be collected from actual distributed LEDs database/27/ for which monitoring will be conducted on an annual basis. The monitoring will provide the value of this parameter. For the grouped

	during time interval t		project, the ex-ante value for this parameter has been taken as 968,782 (9W) and 10,000 (12W), i.e., all lamps are assumed to be operational for ex-ante estimates. The parameter determination approach is found acceptable and justified.

The methodology's equations and options, as well as all other methodological tools, are appropriately quoted in the Joint PD-MR/1/. The emission reductions of the grouped project's project instances would be determined using the formulae specified in the applied methodology; AMS-II.C. v15.0/5/.

VVB verifies that the equations are accurately stated for the determination of emission reductions at project instance level based on the evaluation of the joint PD-MR/1/. The data and requirements supplied in the approach have been compared with the parameters and equations presented in the joint PD-MR/1/ as well as other pertinent documents. The joint PD-MR/1/, ex-ante ER spreadsheet/8/ and methodology AMS-II.C./5/ have all been compared using equations to ensure consistency.

Baseline emissions:

In accordance with para 20 and 21 of the applied methodology, Option 1 i.e., 'Constant Load Equipment's' is applicable for the present project. Baseline emission is calculated using the following equations:

$$BE_y = E_{BL,y} \times EF_{CO2,ELEC,y} + Q_{ref,BL} \times GWP_{ref,BL} \quad \text{Equation 1}$$

As the project entails replacement of LED in place of ICLs hence no refrigerant is involved. The above equation is then modified as:

$$BE_y = E_{BL,y} \times EF_{CO2,ELEC,y} \quad \text{Equation 2}$$

Energy consumption for baseline in year y is calculated as:

$$E_{BL,y} = \sum_i (n_i \times \rho_i \times o_i/(1 - l_y) \text{ x } 0.95 \quad \text{Equation 3}$$

Where:

BE_y	Baseline emissions in year y (tCO_2e)
$E_{BL,y}$	Energy consumption for the baseline in year y (kWh)
$EF_{CO2,ELEC,y}$	Electricity emissions factor. If electricity displaced is grid, the emission factor in year y shall be calculated in accordance with the provisions in AMS-I.D (tCO_2/MWh). If electricity displaced is captive electricity, the emission factor in

	year y shall be calculated in accordance with the "Tool to calculate baseline, project and/or leakage emission from electricity consumption"
$\sum_i$	Sum over the group of i baseline equipment (e.g. 40W incandescent lamps, 5 hp motors) replaced or that would have been replaced. The devices in group i must be closely related by type (e.g. motor), size (e.g. 5 hp), service (e.g. conveyor belt, office building chilled water pump), and any other relevant factors that determine energy consumption of the equipment
n_i	Number of pieces of equipment of the group of i baseline equipment replaced or that would have been replaced
ρ_i	Electrical power demand (kW) of the group of i baseline equipment (e.g., 40W incandescent lamps, 5 hp motors).
o_i	Average annual operating hours of the group of i baseline equipment. The operating hours of the baseline equipment in year y can be determined using surveys by continuous measurement of usage hours of baseline equipment for a minimum of 90 days. For a large population of baseline equipment: (a) Use a representative sample (sampling determined by a minimum 90% confidence interval and 10% maximum error margin); (b) Apply correction for seasonal variation, if any; and (c) Ensure that sampling is statistically robust and relevant, i.e. the selection of the equipment to be analysed for operating hours has a random distribution and is representative of target population (size, location).
l_y	Average annual technical grid losses (transmission and distribution) during year y for the grid serving the locations where the devices are installed, expressed as a fraction. This value shall not include non-technical losses such as commercial losses (e.g. theft). The average annual technical grid losses shall be determined using recent, accurate and reliable data available for the host country. This value can be determined from recent data published either by a national utility or an official governmental body. The reliability of the data used (e.g. appropriateness, accuracy/uncertainty, especially exclusion of non-technical grid losses) shall be established and documented by the project participant. A default value of 0.1 shall be used for average annual technical grid losses, if no recent data are available or the data cannot be regarded accurate and reliable
$Q_{ref,BL}$	Average annual quantity of refrigerant used in the baseline to replace the refrigerant that has leaked (tonnes/year). Only applies to projects that replace equipment containing ODP refrigerants. Values from Chapter 7: Emissions of Fluorinated Substitutes for Ozone Depleting Substances, Volume 3, Industrial Processes and Product Use, 2006 IPCC Guidelines for National Greenhouse Gas Inventories may be used

$GWP_{ref,BL}$	Global Warming Potential of the baseline refrigerant (tCO_2e/t refrigerant)
0.95	Default value of net-to-gross adjustment factor

Sample calculations for Baseline emissions per lamp per year estimated from 2nd year onwards:

$E_{BL,y} = \sum_i (n_i \times \rho_i \times o_i/(1 - l_y)$ x 0.95

= 1 x 0.06 x 2190/(1-0.10)*0.95

= 138 kWh

For 60W

$BE_y = E_{BL,y} \times EF_{CO2,ELEC,y}$

= 138 × 0.915/1000

= 0.126 tCO_2e

For 70W

$BE_y = E_{BL,y} \times EF_{CO2,ELEC,y}$

= 161 × 0.915/1000

= 0.147 tCO_2e

Project emissions:

Project emissions on account of electricity used by the project equipment shall be calculated according to the following equations:

$PE_y = EP_{PJ,y} \times EF_{CO2,y} + PE_{ref,y}$ Equation 4

Where:

PE_y	Project emissions in year y (tCO_2e)
$EP_{PJ,y}$	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 ($tCO2e/y$)

Since the project does not involve use of refrigerant, equation 4 becomes:

$$PE_y = EP_{PJ,y} \times EF_{CO2,y}$$ Equation 5

The project energy consumption in the case of project activities that displace grid electricity is determined as follows using the data of the project equipment or system:

$$EP_{PJ,y} = \sum_t \sum_i (n_i \times \rho_i \times o_i) / (1 - l_y) \text{ X } 0.95$$ Equation 6

Where:

n_i	Number of group i project devices operating in time interval t 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 Note that and may be determined separately or in combination, i.e. as energy consumption. For efficient lighting project activities, default values for the hours of utilization of lamps provided in the methodology may be used.
l_y	Average annual technical grid losses (transmission and distribution) during year y for the grid serving the locations where the devices are installed, expressed as a fraction. This value shall not include non-technical losses such as commercial losses (e.g. theft).
0.95	Default value of net-to-gross adjustment factor

Sample calculations for Project emissions per lamp per year estimated from 2nd year onwards:

For 9W LED

$PE_y = EP_{PJ,y} \times EF_{CO2,y}$

$= 20 \times 0.915/1000$

$= 0.0183\ tCO_2e$

For 12W LED

$PE_y = EP_{PJ,y} \times EF_{CO2,y}$

$= 27 \times 0.915/1000$

$= 0.0247\ tCO_2e$

Leakage emissions:

If the energy efficiency technology uses equipment that has been transferred from another activity, then leakage emissions must be taken into account, as per the applied methodology. Leakage emissions are not relevant in the planned GP because the LEDs that will be given to the households are not being moved from another activity. Also, the project activity instances implemented under this GP activity will ensure the destruction of the replaced ICLs in line with the applied methodology/5/.

Emission reductions:

The project activity under this GP would achieve a total emission reduction of 655,371 tCO_2e for grouped project in the 7-year crediting period (15/07/2021 to 14/07/2028) and an average of 93,624 tCO_2e per year for grouped project as indicated in the final VCS PD/1/ and in the ex-ante ER spread sheet/8/

The equations and choices provided in the methodology and all other methodological tools are correctly quoted in the joint PD-MR/1/ and the ex-ante ER sheet/8/.

Through the assessment process validation team confirmed that:

- All the assumptions and data used by the project participants are listed including their references and sources;
- All documentation used by the project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PD;
- All values used in the PD are considered reasonable in the context of the VCS project activity;
- The baseline methodology has been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions;

In conclusion, all values used in the VCS joint PD-MR/1/ to calculate emission reductions are considered reasonable and the calculation approach is found to be correct.

CL 03 and CAR 06 were raised and resolved.

3.4.7 Methodology Deviations

Not Applicable, since no deviation from the methodology and tools was requested during the validation process.

3.4.8 Monitoring Plan

In accordance with section 6 of the joint PD-MR/1/, the parameters defined ex-ante and those to be monitored ex-post are described as per section 6.1 of the methodology/5/.

The validation team confirms that the overall monitoring plan complies with the requirements of the applied methodology, the monitoring arrangements describes in the monitoring plan are

feasible within the project design and the project proponents will be able to implement the described monitoring plan.

Sampling Plan:

Sampling plan is made according to the CDM Standard 'Sampling and surveys for CDM project activities and programmes of activities'/7/, and CDM Guidelines: Sampling and Survey for CDM project activities and programmes of activities/6/ to estimate monitored parameter values used in the ER calculations. Sampling is applicable to two monitoring parameters which is a proportional parameter and as given below:

Parameter	Description	Ex-ante value
O_i	Average annual operating hours of XW baseline lamp	2,190 (6*365)
$N_{i, project, operational (YW)}$	Total number of project lamps of Y (9W and 12W) wattage that are operational during time interval t	968,782 (9W) and 10,000 (12W)

The target population are the end users listed in the database on which random sampling will be applied, as mentioned under section 6.2 of the joint PD-MR/1/ and is found to be in line with option 1 of the applied methodology. The sample size equations stated in the Joint PD-MR/1/ were checked and found consistent with CDM Guidelines: Sampling and Survey for CDM project activities and programmes of activities, version 4/6/.

The sampling frame is the project database which may include individual PAI or group of PAIs. The PP will apply a 90/10 confidence/precision for individual PAIs on an annual basis, or 95/10 confidence/precision basis on a biennial basis. If sampling is done for groups of PAIs, then 95/10 all be applied in line with CDM Standard Sampling and surveys for CDM project activities and programmes of activities, version 9/7/.

The monitoring plan included in the section 6.3 of the Joint PD-MR /1/ is based on the applied methodology /5/ which has been applied to the proposed VCS grouped project activity.

The monitoring arrangements described in the monitoring plan are feasible within the project design.

Unit size:

For 9W:

Total Energy Savings = Energy consumption by ICLs (Baseline) — Energy consumption by LEDs

= (133,692 – 19,376) MWh/yr

= 114,316 MWh/yr

For 12W:

Total Energy Savings = Energy consumption by ICLs (Baseline) — Energy consumption by LEDs

= (1,610 – 270) MWh/yr

= 1,340 MWh/yr

Average Energy Savings per LED bulb = Total Energy Savings by (9W+12W)/Total sales (estimated)

= 114,316/978,782 MWh/yr

= 0.118 MWh/yr

Hence, the PI/LED energy saving is below 20 GWh/y of type II project limit from the manufacturing specification of LEDs (9W and 12W) and therefore it is a microscale CDM unit. Hence, it is not necessary for the grouped project to show that it complies with the small- or micro-scale thresholds in aggregate. The grouped project is estimated to distribute total 134,938 LEDs for year 2021 (9W), total 579,776 LEDs for year 2022 (577,734 9W LEDs and 2,042 12W LEDs) and total 978,782 LEDs from year 2023 to 2028 (968,782 9W LEDs and 10,000 12W LEDs) as per the PD.

CL 02 was raised and resolved.

3.5 Non-Permanence Risk Analysis

This is not applicable for the proposed VCS project as it is Non AFOLU project.

4 VERIFICATION FINDINGS

4.1 Accuracy of GHG Emission Reduction and Removal Calculations

The joint PD-MR/1/ accurately cities the equations and alternatives provided in the methodology as well as all other methodological tools. The emission reductions of the project instances of the grouped project and project activity instance are determined using the formulae indicated in the applied methodology; AMS-II.C. version 15.0/5/. The verification team examined the emission reduction spreadsheets (ER sheets)/16/ and verified all the calculations, concluding that they were accurate and in line with the PD's monitoring plan and used the monitoring approach.

The emissions are computed as follows using applicable methodology AMS-II.C. (version 15.0)/5/:

Baseline Emission:

$$BE_y = E_{BL,\,y} \times EF_{CO2,ELEC,y} + Q_{ref\,,BL} \times GWP_{ref\,,BL} \qquad \text{Equation 1}$$

As the project entails replacement of LED in place of ICLs hence no refrigerant is involved. The above equation is then modified as:

$BE_y = E_{BL,y} \times EF_{CO2,ELEC,y}$ Equation 2

Energy consumption for baseline in year y is calculated as:

$E_{BL,y} = \sum_i (n_i \times \rho_i \times o_i/(1 - l_y)$ x 0.95 Equation 3

Where:

BE_y	Baseline emissions in year y (tCO_2e)
$E_{BL,y}$	Energy consumption for the baseline in year y (kWh)
$EF_{CO2,ELEC,y}$	Electricity emissions factor. If electricity displaced is grid, the emission factor in year y shall be calculated in accordance with the provisions in AMS-I.D (tCO_2/MWh). If electricity displaced is captive electricity, the emission factor in year y shall be calculated in accordance with the "Tool to calculate baseline, project and/or leakage emission from electricity consumption"
$\sum_i$	Sum over the group of i baseline equipment (e.g. 40W incandescent lamps, 5 hp motors) replaced or that would have been replaced. The devices in group i must be closely related by type (e.g. motor), size (e.g. 5 hp), service (e.g. conveyor belt, office building chilled water pump), and any other relevant factors that determine energy consumption of the equipment
n_i	Number of pieces of equipment of the group of i baseline equipment replaced or that would have been replaced
ρ_i	Electrical power demand (kW) of the group of i baseline equipment (e.g., 40W incandescent lamps, 5 hp motors).
o_i	Average annual operating hours of the group of i baseline equipment. The operating hours of the baseline equipment in year y can be determined using surveys by continuous measurement of usage hours of baseline equipment for a minimum of 90 days. For a large population of baseline equipment: (a) Use a representative sample (sampling determined by a minimum 90% confidence interval and 10% maximum error margin); (b) Apply correction for seasonal variation, if any; and (c) Ensure that sampling is statistically robust and relevant, i.e. the selection of the equipment to be analysed for operating hours has a random distribution and is representative of target population (size, location).
l_y	Average annual technical grid losses (transmission and distribution) during year y for the grid serving the locations where the devices are installed, expressed as a fraction. This value shall not include non-technical losses such as commercial

	losses (e.g. theft). The average annual technical grid losses shall be determined using recent, accurate and reliable data available for the host country. This value can be determined from recent data published either by a national utility or an official governmental body. The reliability of the data used (e.g. appropriateness, accuracy/uncertainty, especially exclusion of non-technical grid losses) shall be established and documented by the project participant. A default value of 0.1 shall be used for average annual technical grid losses, if no recent data are available or the data cannot be regarded accurate and reliable
$Q_{ref,BL}$	Average annual quantity of refrigerant used in the baseline to replace the refrigerant that has leaked (tonnes/year). Only applies to projects that replace equipment containing ODP refrigerants. Values from Chapter 7: Emissions of Fluorinated Substitutes for Ozone Depleting Substances, Volume 3, Industrial Processes and Product Use, 2006 IPCC Guidelines for National Greenhouse Gas Inventories may be used
$GWP_{ref,BL}$	Global Warming Potential of the baseline refrigerant (tCO_2e/t refrigerant)
0.95	Default value of net-to-gross adjustment factor

Sample calculation for Bihar:

The baseline emissions for MP-1st year of the project activity is as follows:

$BE_y = E_{BL,y} \times EF_{CO2,ELEC,y}$

BE_y = 4,682,285 x 0.915

= 4,284 tCO_2e

The baseline emissions for, MP- 2nd year of project activity is as follows:

$BE_y = E_{BL,y} \times EF_{CO2,ELEC,y}$

BE_y = 7,307,566 x 0.915

= 6,686 tCO_2e

The baseline emissions for 70W ICLs bulb (replaced with 12W) for Grouped project is as follows:

$BE_y = E_{BL,y} \times EF_{CO2,ELEC,y}$

BE_y = 45,316 x 0.915

= 41 tCO_2e

The PP has followed the above approach for baseline emission calculations which involves calculating emission reductions for all households in a state by calculating average annual operating hours for all households. Additionally, another approach which involves calculating

each household's emission reductions has also been used where the annual operating hours for each of the HHs throughout the monitoring period are used.. The final baseline emission computation has been taken as the conservative value between the two methods.

Project Emission:

Project emissions on account of electricity used by the project equipment shall be calculated according to the following equations:

$PE_y = EP_{PJ,y} \times EF_{CO2,y} + PE_{ref,y}$ Equation 4

Where:

PE_y	Project emissions in year y (tCO_2e)
$EP_{PJ,y}$	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)

Since the project does not involve use of refrigerant, equation 4 becomes:

$$PE_y = EP_{PJ,y} \times EF_{CO2,y}$$ Equation 5

The project energy consumption in the case of project activities that displace grid electricity is determined as follows using the data of the project equipment or system:

$$EP_{PJ,y} = \sum_t \sum_i (n_i \times \rho_i \times o_i) / (1 - l_y) \text{ X } 0.95$$ Equation 6

Where:

n_i	Number of group i project devices operating in time interval t 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 Note that and may be determined separately or in combination, i.e. as energy consumption. For efficient lighting project activities, default values for the hours of utilization of lamps provided in the methodology may be used.

l_y	Average annual technical grid losses (transmission and distribution) during year y for the grid serving the locations where the devices are installed, expressed as a fraction. This value shall not include non-technical losses such as commercial losses (e.g. theft).
0.95	Default value of net-to-gross adjustment factor

Sample calculation for Bihar:

The project emissions for MP-1st year of the project activity for 9W LED is as follows:

$PE_y = EP_{PJ,y} \times EF_{CO2,y}$

PE_y = 702,343 x 0.915

= 643 tCO_2e

The project emissions for MP-2nd year of the project activity for 9W LED is as follows:

$PE_y = EP_{PJ,y} \times EF_{CO2,y}$

PE_y = 1,096,135 x 0.915

= 1,003 tCO_2e

The project emissions for 12W LED for the project activity is as follows:

$PE_y = EP_{PJ,y} \times EF_{CO2,y}$

BE_y = 7,768 x 0.915

= 7 tCO_2e

The PP has followed the above approach for project emission calculations which involves calculating emission reductions for all households in a state by calculating average annual operating hours for all households. Additionally, another approach which involves calculating each household's project emissions has also been used where the annual operating hours for each of the HHs throughout the monitoring period are used. The final project emission computation has been taken as the conservative value between the two methods.

Final Emission Reduction Calculations:

Approach 1: Average operational hour of all the HHs

The emission reduction of 9W LED for MP-1st year is calculated as:

ER = BEy - PE_y

= 4,284 - 643

= 3,641 tCO_2e

The emission reduction of 9W LED for MP-2nd year is calculated as:

$ER = BEy - PE_y$

$= 6,686 – 1,003$

$= 5,683\ tCO_2e$

The emission reduction of 12W LED is calculated as:

$ER = BEy - PE_y$

$= 41 – 7$

$= 34\ tCO_2e$

Approach 2: Considering operating hour for each HHs

The emission reduction of 9W LED for MP-1st year is calculated as:

$ER\ (cross\ check) = BEy - PE_y$

$= 4,280 - 643$

$= 3,637\ tCO_2e$

The emission reduction of 9W LED for MP-2nd year is calculated as:

$ER\ (cross\ check) = BEy - PE_y$

$= 6,334 - 951$

$= 5,383\ tCO_2e$

The emission reduction of 12W LED is calculated as:

$ER\ (cross\ check) = BEy - PE_y$

$= 41 - 8$

$= 33\ tCO_2e$

The PP has followed the above approach for emission reduction calculations which involves calculating emission reductions for all households in a state by calculating average annual operating hours for all households. Additionally, another approach which involves calculating each household's emission reductions has also been used where the annual operating hours for each of the HHs throughout the monitoring period are used. The final emission reduction computation has been taken as the conservative value between the two methods.

.Leakage emissions:

If the energy efficiency technology uses equipment that has been transferred from another activity, then leakage emissions must be taken into account, as per the applied methodology.

Leakage emissions are not relevant in the planned GP because the LEDs that will be given to the homeowners are not being moved from another activity. Also, the project activity instances implemented under this GP activity will ensure the destruction of the replaced ICLs in line with the applied methodology/5/.

Hence, $LE_y = 0$

A. Data and parameters available at the time of validation are same as listed above under section 3.4.6 of this report

B. Data/Parameter monitored under first year of MP:

<table>
<tr><th>S.No.</th><th>Parameter</th><th>Monitoring frequency</th><th>Means of assessment</th></tr>
<tr><td>1.</td><td>$n_{i, b (XW)}$</td><td>Annual or at the time of monitoring</td><td>The parameter represents number of baseline lamps of X wattage replaced. The monitoring survey records/11/, and the ER sheet/16/ have been compared with the reported data in the joint PD-MR/1/. The total number of replaced LEDs has been cross-checked against the PP's database/27/.
<table><tr><th></th><th>ICLs replaced</th></tr><tr><td>60W</td><td>702,281</td></tr><tr><td>70W</td><td>4,744</td></tr></table>
The total number of LEDs replaced under the current monitoring period is 707,025/16/.

VVB confirms on the basis of on-site audit/17/ that the PP has performed monitoring survey on LEDs operation through interviews with the end-users.</td></tr>
<tr><td>2.</td><td>$n_{i \text{ baseline scrapped } (XW)}$</td><td>Annual</td><td>The parameter represents the number of baseline lamps of X wattage destroyed. The value of the parameter considered below:
<table><tr><th></th><th>ICLs destroyed</th></tr><tr><td>60W</td><td>702,281</td></tr></table></td></tr>
</table>

			<table><tr><td>70W</td><td>4,744</td></tr></table> The data has been determined from the distribution database/27/ recorded for each household at the time of project LED distribution inline to the applied methodology/5/. The value is consistently applied and reported between ER sheet/16/ and Joint PD-MR/1/. The monitoring samples checked by VVB at the time of on-site visit/17/ were questioned on the baseline device and the handover of these baseline device and all the responses were checked with the available information in the monitoring survey/11/. This was checked on-site/17/ and found as sufficiently following the requirements. Furthermore, the contract between the PP and ICL destruction agency/15/ was also reviewed by the VVB, and it was further cross-checked with the time stamped video of the destruction event/28/ which confirms that the agency was hired for collection and destruction of the baseline lamps. Therefore, VVB confirms that the replaced ICLs was collected and disposed of as per the methodology requirements.
3.	O_i	Once during the crediting period	The parameter represents the average annual operating hours of XW baseline lamp. The value of the parameter considered below: <table><tr><th>State</th><th>Operating hours</th></tr><tr><td>Madhya Pradesh</td><td>6.1</td></tr><tr><td>Chhattisgarh</td><td>5.2</td></tr></table>

			<table><tr><td>Tamil Nadu</td><td>5.6</td></tr><tr><td>West Bengal</td><td>6.2</td></tr><tr><td>Maharashtra</td><td>5.2</td></tr><tr><td>Gujarat</td><td>5.2</td></tr><tr><td>Odisha</td><td>5.5</td></tr><tr><td>Jharkhand</td><td>5.2</td></tr><tr><td>Uttar Pradesh</td><td>5.1</td></tr><tr><td>Kerela</td><td>5.8</td></tr><tr><td>Bihar</td><td>5.6</td></tr><tr><td>Goa</td><td>5.3</td></tr><tr><td>Rajasthan</td><td>5.0</td></tr><tr><td>Karnataka</td><td>5.7</td></tr><tr><td>Haryana</td><td>5.0</td></tr><tr><td>Uttarakhand</td><td>5.5</td></tr><tr><td>Chandigarh</td><td>6.2</td></tr><tr><td>Puducherry</td><td>6.5</td></tr><tr><td>Punjab</td><td>5.7</td></tr><tr><td>Himachal Pradesh</td><td>5.3</td></tr><tr><td>Assam</td><td>6.4</td></tr><tr><td>Sikkim</td><td>5.6</td></tr></table> The value used for the monitored parameter has been cross checked with the run time meter records /43/ and the interviews conducted with the end users during the on-site visit/17/. The seasonal variations calculations have been taken from the 90-day run time meter survey data and day light hours for each state which has been verified by the VVB. The

			value found has been found correct, justified and consistent.
4.	$N_{i,\ project,\ operational\ (YW)}$	Annual	This parameter represents the total number of project lamps of Y wattage that are operational during time interval t. The value used for 9W LED in MP—1st year is 331,724 and 9W+12W LED in MP—2nd year is 691,250 for the current MP. The values have been sourced from the monitoring surveys/11/. As checked from the monitoring survey results/11/ carried out for the first monitoring period, it has been concluded that the end users were using the device which was further confirmed during the on-site audit/17/. The value of the parameter was found as acceptable, and sufficiently fulfilling the methodological/5/ requirements.

PP has done monitoring for both 9W and 12W LEDs during the monitoring survey of the project. The survey results/11/ has been added in the ER sheet/16/. It was further cross-checked by the end users during the on-site visit/17/ conducted by the VVB and thus confirms that the data presented in the ER sheet is appropriate and monitoring has been carried out by the PP in line with the applied methodology/5/. Although VVB confirms that the PP has changed the approach of ER calculation by considering a project Instance as single unit which has capacity less than the microscale limits (<20GWh) therefore the capacity limit doesn't apply to the Grouped project in aggregate and the PP has removed the concept of batches. Therefore, the monitoring surveys were conducted again to check the duplicity of the data and the new samples considered were found to be appropriate and valid for the revised approach.

In conclusion, VVB reviewed all the evidence submitted by PP related to GHG emission reduction calculations and confirmed that all the parameters are correctly applied. Default values used in the calculation were identified correctly. The emission reduction calculation has been done in line with the applied methodology /5/.

CAR 07 was raised and resolved.

Monitoring Plan for the current MP:

For the current monitoring, PP had calculated the sample size as per the CDM standard requirements/6,7/. In accordance with the applied methodology, AMS-II.C, Version 15.0/5/, reliability criteria were set at 90% confidence and 10% accuracy for the Simple Random Sampling

operation that was correctly carried out by the PP. The verification team accepts the Simple Random Sampling option as it is mentioned in the VCS joint PD-MR/1/.

The sampling surveys were conducted by well-trained staff. Monitoring sample surveys/11/ are used to keep track of the monitoring parameters O_i and $N_{i,\ project,\ operational\ (YW)}$. The monitoring of these parameters ensures compliance with the applied methodology AMS-II.C, Version 15.0/5/. The survey records/11/ and the sample size estimation from the ER sheet/16/ have both been examined by the verification team. The assessment team has checked the sample calculation as per the Guideline: "Sampling and Survey for CDM project activities and programme of activities" version 04/6/ for the monitored parameters O_i and $N_{i,\ project,\ operational\ (YW)}$ and found out that the calculation of confidence/precision is consistent as per the monitoring plan.

The verification team certifies that all parameters are used appropriately in the calculations, all conclusions are transparent and verifiable, all underlying assumptions are documented and supported by verifiable data, and calculations are performed in line with the pre-established equations from the joint PD-MR/1/. The total number of emission reductions for the monitoring period 15/07/2021 to 31/03/2023 for the grouped project is 48,430 tCO_2e.

The verification team has checked and confirmed the calculations in the ER sheet/16/ and found to be accurate. The consistency and formulae were verified and found to be accurate.

4.2 Quality of Evidence to Determine GHG Emission Reductions and Removals

The assessment team confirms that the calculation and data is authentic. The quality of supporting documents submitted for validation and verification are adequate. The assessment team has checked the quality and maintenance of the supporting documents during the on-site visit to confirm the authenticity of the documents and to check the appropriate calculations. The assessment team confirms that the proper evidence is available for the whole monitoring period and the same is verifiable and the data collection system meets the requirement of the monitoring plan and the applied methodology according to the assessment carried out.

The assessment team confirms the quality of evidence to determine the GHG reductions are satisfactory and the detailed information regarding the roles and responsibilities have been provided in the Joint PD-MR/1/.

5 VALIDATION AND VERIFICATION OPINION

Earthood, contracted by MicroEnergy Credits Corporation (PP), has performed the independent joint validation & verification of the project activity "MicroEnergy Credits – Microfinance for

Efficient Lighting Product Lines - India". The PP is responsible for the information about the implementation of the project activity.

Earthood commenced the joint validation & verification based on the baseline and monitoring methodology AMS.II.C, version 15.0/5/ and draft VCS PD-MR and ERs estimated spreadsheet/8/.

Earthood's validation approach is based on the understanding of the risks associated with reporting the project activity, estimates of GHG emission data and the controls to be implemented to mitigate these. Earthood planned and performed the validation and verification by obtaining evidence, site visit, other information, and explanations that ESPL considered necessary to give reasonable assurance that the estimated GHG emission reductions are fairly to be achieved.

Further, the validation and verification of the GHG statement was conducted in accordance with ISO 14064-3; 2019 by the ESPL assessment team.

Therefore, the VVB confirms that:

- the project activity is in accordance with all relevant host country criteria (India) and VCS rules and requirements.
- the project activity is in accordance with all conditions of the latest version of the applied methodology.
- the environmental assessment is appropriate and sufficient.
- the monitoring plan is transparent and adequate.
- all information has been consistently applied in the VCS Joint PD-MR.
- the implementation of the project has been done as per description in the VCS Joint PD-MR.

Quantity of GHG emission reductions or removals in tCO_2 equivalents are estimated to be 655,371 for the grouped project throughout the crediting period and 93,624 is the annual average reduced ERs for the grouped project. The validated ex-ante emissions reductions are as follows:

Year	Estimated GHG emission reductions or removals (tCO_2e)
2021 (15/07/2021 to 31/12/2021)	6,788
2022 (01/01/2022 to 31/12/2022)	62,628
2023 (01/01/2023 to 31/12/2023)	105,825

2024 (01/01/2024 to 31/12/2024)	105,825
2025 (01/01/2025 to 31/12/2025)	105,825
2026 (01/01/2026 to 31/12/2026)	105,825
2027 (01/01/2027 to 31/12/2027)	105,825
2028 (01/01/2028 to 14/07/2028)	56,827
Total estimated ERs	**655,371**
Total number of crediting years	**7**
Average annual ERs	**93,624**

Quantity of GHG emission reductions or removals in tCO_2 equivalent achieved by the project during the verification period is as follows:

Verification period: from 15/07/2021 to 31/03/2023

Verified GHG emission reductions and removals in the above verification period for the Grouped Project is reported below:

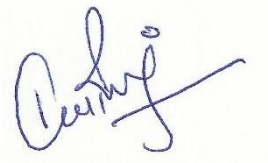
Year	Baseline emissions or removals (tCO2e)	Project emissions or removals (tCO2e)	Leakage emissions (tCO2e)	Net GHG emission reductions or removals (tCO2e)
2021 (15-July-2021 - 31-December - 2021)	15,506	2,333	-	13,173
2022 (01-January-2022 - 31-December - 2022)	33,292	5,009	-	28,283
2023 (01-January-2023 - 31-March - 2023)	8,209	1,235	-	6,974

Total	57,007	8,577	-	48,430

Comparison between the estimated ex-ante GHG emission reductions and removals and the achieved emission reductions and removals for the current monitoring period is reported below:

Ex-ante emissions reductions /removals	Achieved emissions reductions /removals	Percent difference	Justification for the difference
95,510	48,430	49%	There is a 49% difference in the ex-ante estimates and the actuals obtained for the first monitoring period since the scope of this activity is joint registration and issuance of VCUs. This difference is observed due to the operating hours calculated for each state has been used in ex-post calculations whereas in ex-ante the same value has been used for all. Moreover, it has been observed that the operational lamps have been reduced in the ex-post scenario.

Approved by



Dr. Kaviraj Singh

Managing Director

Earthood Services Private Limited

Date: 04/03/2024

Place: Gurgaon, Haryana

APPENDIX I: LIST OF DOCUMENTS REFERRED

S.No.	Title of document	Version	Date
1.	VCS joint PD-MR	Version 1.7	27/02/2024
2.	VCS Program guide	Version 4.3	17/01/2023
3.	VCS Standard	Version 4.4	17/01/2023
4.	VCS VVB Manual	Version 3.2	19/10/2016
5.	AMS-II.C. Demand-side energy efficiency activities for specific technologies	Version 15.0	25/11/2005
6.	CDM Guidelines Sampling and surveys of CDM project activities and programmes of activities	Version 4	16/10/2015
7.	CDM Standard Sampling and surveys for CDM project activities and programmes of activities	Version 9	27/05/2021
8.	Ex-ante Emission Reduction calculation sheet	Pertaining to latest JPD-MR	-
9.	Date of first LED unit distribution	-	15/07/2021
10.	Manufacturer's specification	-	Last accessed on 07/07/2023
11.	Monitoring survey results	-	-
12.	Baseline survey results	-	Last accessed on 07/07/2023
13.	Employment records	-	Last accessed on 14/02/2023
14.	End user agreement – Carbon Waiver form	-	-
15.	Agreement with contractor for destruction of ICLs	-	-
16.	Emission Reduction calculation sheet	Version 1.6	02/01/2024
17.	1. VVB On-site visit evidence 2. VVB Remote site evidence	-	-
18.	No involvement with other ETS and GHG programs	-	28/06/2023

19.	Solid Waste Management Rules, 2016 https://cpcb.nic.in/uploads/MSW/SWM_2016.pdf	-	08/04/2016
20.	AMS-I.D. Grid connected renewable electricity generation	Version 18.0	-
21.	Tool 21 Demonstration of additionality of small-scale project activities	Version 13.1	01/09/2020
22.	Tool 7 Tool to calculate the emission factor for an electricity system	Version 7.0	31/08/2018
23.	Tool 1 Tool for the demonstration and assessment of additionality	Version 7.0	23/11/2012
24.	Methodological tool to determine the remaining lifetime of equipment	Version 01	-
25.	Guideline: General guidelines for SSC CDM methodologies	Version 23.1	-
26.	CEA database	Version 17.0	Last accessed on 14/02/2023
27.	Project database/Distribution Record	-	-
28.	Time stamped video of destruction of ICLs and photos	-	-
29.	Photos of LEDs	-	-
30.	GPS coordinates	-	-
31.	MoU between PP and Implementing Partners for carbon wavier	-	-
32.	VCS registry https://registry.verra.org/app/projectDetail/VCS/4196	-	Last accessed on 12/02/2023
33.	IRR sheet	-	-
34.	IRR sheet evidences: 1) Logistics Receipt 2) Purchase receipt of Run time meter	-	-

	3) Purchase order of LEDs and invoice 4) Travel expense summary sheet 5) Signed contract with VVB		
35.	LSC meeting invitations including emails and notices	-	11/02/2023
36.	Attendance sheet	-	-
37.	Continuous grievance mechanism and feedback forms	-	-
38.	CDM website https://cdm.unfccc.int/Reference/tools/index.html	-	Last accessed on 12/02/2023
39.	National regulations Enhanced Energy Efficiency (NMEEE) in 2009 and the Energy Conservation Act, 2001	-	-
40.	CO2 Baseline Database for the Indian Power Sector, User Guide	Version 18.0	-
41.	Pilot study on Operational hours	-	-
42.	Agreement between the following: • PP, MFIs and End users • MFIs and manufacturers		
43.	Run time meter records for seasonal variations	-	-
44.	Manufacture specifications for 9W and 12W project LED bulbs or https://amazon.in/9W-Lumistar-LED-Bulb-Pack-2/dp/B0CK2NHCSZ/ref=sr_1_4_sspa?keywords=9w+LED&qid=1697605873&sr=8-4-spons&sp_csd=d2lkZ2V0TmFtZT1zcF9hdGY&psc=1 and https://www.amazon.in/MAGIK-Savio-Rechargable-Emergency-Inverter/dp/B0BXDK29YH/ref=sr_1_4_sspa?crid=22WE4IPAKPIBJ&keywords=12w%2BLED&qid=1697605981&sprefix=12w%2Bled%2Caps%2C215&sr=8-4-spons&sp_csd=d2lkZ2V0TmFtZT1zcF9hdGY&th=1	-	Last accessed on 29/12/2023

45.	Historical data of SBI which represents the 'Benchmark Prime Lending Rate' https://www.sbi.co.in/web/interest-rates/interest-rates/benchmark-prime-lending-rate-historical-data	-	Last accessed on 29/12/2023
46.	Tool 19 Demonstration of additionality of microscale project activities	Version 10.0	08/09/2022
47.	Declaration by PP that another Grouped project using same technology with instances within 10 km of the instances of this Grouped project will not be added	-	29/12/2023
48.	Emission Reduction purchase Agreement signed with the buyer by MEC	-	-
49.	World Bank Data https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?end=2022&locations=IN&name_desc=false&start=1960&view=chart	-	Last accessed on 29/12/2023
50.	IRR decision date document	-	26/06/2021
51.	Weblinks and photographs of the LEDs packaging to confirm the MRP of the LEDs	-	-

APPENDIX II: ABBREVIATIONS

Abbreviations	Full texts
BE	Baseline Emission
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CL	Clarification Request
CO_2	Carbon di oxide
CP	Crediting Period
DR	Desk Review
EB	Executive Board
EF	Emission Factor
ER	External Resource
EIA	Environmental Impact Assessment
ESPL	Earthood Services Private Limited
FAR	Forward Action Request
GHG	Green House Gas
GP	Grouped Project Activity
ICLS	Incandescent Lamps
MR	Monitoring Report
PAI	Project Activity Instance
PD	Project Description
PP	Project Proponent
tCO_2e	Tonnes of Carbon di oxide equivalent
TA	Technical Area
TR	Technical Reviewer
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard
VCU	Verified Carbon Units
VVB	Validation and Verification Body

APPENDIX III: COMPETENCE OF TEAM MEMBERS AND TECHNICAL REVIEWERS

Competence Statement			
Name	Charu Patwal		
Education	M.Sc. Environmental Science		
Experience	3 years 4 months		
Field	Research & Sustainability		
Approved Roles			
Team Leader	YES (VM)		
Validator	YES (VM)		
Verifier	YES (VM)		
Methodology Expert	NO		
Local expert	YES (India)		
Financial Expert	NO		
Technical Reviewer	NO		
TA Expert (X.X)	YES (TA 3.1)		
Reviewed by	Shifali Guleria (Quality Manager)	**Date**	08/07/2023
Approved by	Deepika Mahala (Technical Manager)	**Date**	08/07/2023

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., AMS III.AR, AM0029, AM0025, AM0056, ACM0001, ACM0002, ACM0004, ACM0012, ACM0006, AM0018, ACM0017, ACM0009, AM0034, AMS.I.B, ACM0016, AMS-III.BL, AMS-II.L, AMS-I.I., AMS-III.A.O., ACM0010, ACM0025
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	Shifali Guleria	**Date**	06/03/2023
Approved by	Deepika Mahala	**Date**	06/03/2023

Competence Statement			
Name	Abhishek Koul		
Education	Bachelor of Technology in Mechanical Engineering		
Experience	-		
Field	-		
Approved Roles			
Team Leader	NO		
Validator	NO		
Verifier	NO		
Methodology Expert	NO		
Local expert	NO		
Financial Expert	NO		
Technical Reviewer	NO		
TA Expert (X.X)	NO		
Trainee	YES		
Reviewed by	Shifali Guleria (Quality Manager)	**Date**	12/07/2023
Approved by	Deepika Mahala (Technical Manager)	**Date**	12/07/2023

Competence Statement			
Name	Ashish Yadav		
Education	M.Sc Environmental Sciences B.Sc Biotechnology		
Experience	1 Year		
Field	Wastewater treatment		
Approved Roles			
Team Leader	NO		
Validator	NO		
Verifier	NO		
Methodology Expert	NO		
Local expert	NO		
Financial Expert	NO		
Technical Reviewer	NO		
TA Expert (X.X)	NO		
Trainee	Yes		
Reviewed by	Shifali Guleria (Quality Manager)	**Date**	12/07/2023
Approved by	Deepika Mahala (Technical Manager)	**Date**	12/07/2023

Competence Statement			
Name	Abhimanyu Singh Wazir		
Education	MSc Environmental and Energy Engineering		
Experience	-		
Field	Climate Change & Energy Engineering		
Approved Roles			
Team Leader	NO		
Validator	NO		
Verifier	NO		
Methodology Expert	NO		
Local expert	NO		
Financial Expert	NO		
Technical Reviewer	NO		
TA Expert (X.X)	NO		
Trainee	YES		
Reviewed by	Shifali Guleria (Quality Manager)	**Date**	27/06/2023
Approved by	Deepika Mahala (Technical Manager)	**Date**	27/06/2023

Competence Statement			
Name	Shifali Guleria		
Education	M.Sc. (Environmental Studies and Resource Management), TERI University		
Experience	3+ year		
Field	Climate Change		
Approved Roles			
Team Leader	YES		
Validator	YES		
Verifier	YES		
Methodology Expert	YES (AMS-I.A., AMS-II.G., AMS-II.E., AMS-III.A.V., AMS-I.D, ACM0002)		
Local expert	YES		
Financial Expert	NO		
Technical Reviewer	YES		
TA Expert	YES (1.2, 3.1)		
Reviewed by	Deepika Mahala	**Date**	18/02/2022
Approved by	Ashok Gautam	**Date**	18/02/2022

APPENDIX IV: LIST OF FINDINGS

CAR: Corrective Action Request

CL: Clarification Request

FAR: Forward Action Request

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

FAR ID	NA	**Section no.**	NA	**Date :** DD/MM/YYYY
Description of FAR				
NA				
Project participant response				**Date :** DD/MM/YYYY
NA				
Documentation provided by project participant				
NA				
VVB assessment				**Date:** DD/MM/YYYY
NA				

Table 2.CL from this joint validation and verification

CL ID	01	**Section no.**	3.3.2	**Date :** 30/05/2023
Description of CL				
Issue: In section 2.2 of the joint PD-MR, the project proponent states that they will maintain the logbook to record the query/complaints of the stakeholders and will share the contact details and location to the end users. The location & contact details where the grievance logbook will be kept for query/complaint has not been mentioned. **Action Item:** PP shall clarify if the location for maintaining the grievance logbook will be for all 21 states and shall include the location & contact details where the grievance logbook will be kept for query/complaint. **Program rule:** VCS Standard v4.4				
Project participant response				**Date :**04/07/2023
The statement has been edited to include the grievance can be registered by stakeholders through a google-link which was shared with the stakeholders during LSC.				
Documentation provided by project participant				
Revised joint PD_MR				
VVB assessment				**Date:** 10/07/2023
In the revised joint PD-MR, it has now been mentioned that the stakeholders were provided the helpline number and the email IDs of the respective partners who are involved in this project. However, it has not been mentioned in the joint PD-MR about sharing the google link with the stakeholders during LSC. Kindly clarify if the same google link can be used by the stakeholder to register the grievance or is there any other mechanism to register the grievance and if the PP has explained to the stakeholders how to register the grievance if they face any issues. Hence, CL 01 remains OPEN.				
Project participant response				**Date :** 11/07/2023

The PD-MR has been revised to include the process of grievance registration that is by providing google link to the stakeholders during LSC and they can also register their complaints through the same google link at the MFIs branch offices.
Documentation provided by project participant
The google link details have been provided to the VVB.
VVB assessment **Date:** 12/07/2023
The project proponent has revised the joint PD-MR and has included the process of grievance registration. The local stakeholders were also informed about mechanism to register their grievances via google link during the LSC meeting and they can register their complaints using the same link at the nearest MFI branch office if they need assistance. VVB has verified the same through interviews with stakeholders and found that they have no grievance related to the LEDs. Hence, CL 01 is closed.

CL ID	02	**Section no.**	3.4.8	**Date :** 30/05/2023
Description of CL				
Issue: In section 6.3 of the joint PD-MR, • Point 3 Sampling frame of the sampling plan states that *"All units will have a unique identification no.- Electricity meter serial no."*. It is not clear whether project lamps will also have the unique ID or not. • It has been stated under point G "Roles and responsibilities of project proponent" that LEDs with equivalent or higher lumen output will be provided for free in exchange for ICL. However, under section 3.5 of the joint PD-MR it has been mentioned that project lamps have been provided to the end users on loan. **Action Item:** • PP shall clarify if only electricity meters will be having the unique ID no., or the project lamps will also have the unique ID. • PP shall clarify if the project lamps were provided to the end users free of cost or provided loan to them. **Program rule:** VCS joint PD-MR template guidelines v4.2				
Project participant response				**Date :** 04/07/2023
• The project lamps (LEDs) have a permanent marking on them with details like VERRA ID and lamp technical details. The same has been clarified in section 6.3 of the joint PD-MR. • The Project lamps were provided to the end users at the market price on a weekly/bilateral loan basis. The statement has been corrected in the revised PD-MR				
Documentation provided by project participant				
• The photo of the LEDs with unique ID is being shared • Revised joint PD-MR				
VVB assessment				**Date:** 10/07/2023
• VVB has verified from the photograph of the LED that marking has been done on the project lamp in which unique ID, Verra ID and its technical details like wattage has been mentioned on the project lamp which confirms that LEDs have unique identification number. CLOSED. • The revised joint PD-MR has been reviewed and found that the statement has been revised by the PP. The on-site audit confirmed that the project lamps were given to the end users at the going rate on a weekly or bilateral loan basis which confirms the statement stated in the joint PD-MR. CLOSED. Hence, CL 02 is closed.				

CL ID	03	Section no.	3.4.6	Date : 30/05/2023

Description of CL

Issue:

Following are the observations in the ex-ante ER calculation sheet,

- In the 'Installation Schedule' worksheet, LED sales of 9W and 12W have been mentioned for the project activity instance batch from Year 2021 to 2028. It is not clear if the total sales estimated for the crediting period is 3,390,990 or not as in various sections of joint PD-MR, the value has been considered 463,949.
- In the 'Baseline Emission' worksheet, it has been observed that for 70W & 75W the value of parameter 'ni' has been considered as 1. However, in section 6.2 and 7.1 of the joint PD-MR, the value applied has been considered 590,203.
- In the Project Emission' worksheet, it has been observed that for 9W & 12W the value of parameter 'ηi, project,operational' has been considered as 1. However, in section 6.2 and 7.1 of the joint PD-MR, the value applied has been considered 590,203.
- In the 'Emission Reduction' worksheet, the total LED lamp sales in cell B4 have been considered for the year 2023, for 9W LED sales in cell B5 and 12 W LED sales in cell B6 have been considered for the year 2022.

Action Item:

- PP shall clarify the total sales estimated for the entire crediting period and mention the same in the joint PD-MR also.
- PP shall clarify how the number of baseline lamps of X wattage replaced has been considered as 1. Also, how the value of this parameter for section 6.2 which is used for ex-ante estimation of ERs and section 7.1 which is used for ex-post monitoring of ERs are same.
- PP shall clarify how the total number of project lamps of X wattage that are operational has been considered as 1. Also, how the value of this parameter for section 6.2 which is used for ex-ante estimation of ERs and section 7.1 which is used for ex-post monitoring of ERs are same.
- PP shall clarify the inconsistency and why only one year has been considered and not the entire crediting period.

Program rule:

VCS joint PD-MR template guidelines v4.2, AMS-II.C v15.0

Project participant response	Date : 04/07/2023

- The statement has been corrected in the revised joint PD-MR and now includes the total sales for the entire Crediting Period for both the project Activity batch under implementation and is consistent with the ER calculation sheets. Further, the sales limit for future Project Activity batches has also been shown under worksheet "small scale limits" of ex-ante sheet and discussed in section 4.1 of the PD-MR.
- The ICLs replaced under the project activity are 60W and 70W wattage lamps and the value of the parameter 'ni' has now been updated in the ex-ante, ER sheet and joint PD-MR
- The value of parameter 'ηi, project,operational' has been considered as 1 in the ex-ante sheet where calculations have been shown for 1 bulb which can be used for any project activity batch, however the value of the parameter 'ηi, project,operational' for project activity batches has been considered in the 'Emission Reduction' worksheet.
- The joint PD-MR and ER sheets the values have been updated.

Documentation provided by project participant

Revised joint PD-MR, Ex-ante ER calculation sheet

VVB assessment	Date: 10/07/2023

• The project proponent has included the correct values of the total sales for the entire crediting period under section 3.2 of the joint PD-MR which has been verified from the ex-ante ER calculation sheet and found to be correct. CLOSED. • In the 'Baseline Emission' worksheet, it has been observed that for 60W & 70W the value of parameter 'ni' has been considered as 1 which has been mentioned in Cell C8 and D8 respectively. Kindly clarify how the number of baseline lamps of X wattage replaced has been considered as 1 as the source of this data has been taken from the Sales database. Also, it has been mentioned in various sections of the joint PD-MR that replacement of 60W to 70W will be done with 9W and 70-75W with 12W LEDs whereas in the 'Baseline emission' worksheet, under Cell C4 and D4 it has been stated 60W and 70W which implies that 60W ICL has been replaced with 9W LED and 70W ICL has been replaced with 12W LED which contradicts the above statement. Please clarify. OPEN. • In the Project Emission' worksheet, it has been observed that for 9W & 12W the value of parameter 'ηi, project,operational' has been considered as 1 which has been mentioned in Cell C8 and D8 respectively. Kindly clarify how the total number of project lamps of X wattage that are operational has been considered as 1 as the source of this data has been taken from the Sales database. OPEN. • The estimated total LED sales have been considered for PAI batch 1 as 478,782 for 9W LEDs and 490,000 for 9W LEDs and 10,000 for 12W LEDs under PAI batch 2. The same has been reflected in the worksheets 'Installation Schedule' and 'Emission Reduction' which were found to be appropriate. CLOSED. • In the 'Emission Reduction' worksheet, the dates and values have been mentioned under Cell I6, I7, I8, J6, J7 and J8. PP is requested to mention what these dates and values signify by providing the headings. OPEN. Hence, CL 03 remains open.
Project participant response **Date :** 11/07/2023
• The value of parameter 'ηi' has been considered as 1 in the ex-ante sheet where calculations have been shown for 1 bulb which can be used for any project activity batch and the value of the parameter 'ηi' for project activity batches has been considered in the 'Emission Reduction' worksheet. Further, it has been clarified in the PD-MR that in the project activity 60W ICLS shall be replaced with 9W LEDs and 70W ICLs shall be replaced with 12W LEDs. • The value of parameter 'ηi, project,operational' has been considered as 1 in the ex-ante sheet where calculations have been shown for 1 bulb which can be used for any project activity batch, and the value of the parameter 'ηi, project,operational' for project activity batches has been considered in the 'Emission Reduction' worksheet. • Appropriate headings have now been added to the data mentioned in cell I6, I7, I8, J6, J7 and J8 of the revised 'Emission Reduction' worksheets
Documentation provided by project participant
Revised joint PD-MR, Revised Ex-ante ER calculation sheet
VVB assessment **Date:** 12/07/2023

- The project proponent has provided the baseline emission calculations for 1 bulb which can be used for any project activity batch, therefore the value of parameter 'ηi' has been considered as 1 in the 'Baseline Emission' worksheet of the ex-ante ER calculation sheet.
  Also, it has been further clarified in the joint PD-MR that 60W ICLs will be replaced with 9W LEDs and 70W will be replaced with 12W LEDs and it has been revised throughout the joint PD-MR which was found to be correct. CLOSED.
- The project proponent has provided the project emission calculations for 1 bulb which can be used for any project activity batch, therefore the value of parameter 'ηi project,operational' has been considered as 1 in the 'Project Emission' worksheet of the ex-ante ER calculation sheet which was found to be appropriate. CLOSED.
- The revised ex-ante ER sheet has been reviewed and found that the PP has provided appropriate headings for the data which has been mentioned under cell I6, I7, I8, J6, J7 and J8 which was found to be appropriate. CLOSED.

Hence, CL 03 is closed.

CL ID	04	Section no.	3.4.5	Date : 12/05/2023
Description of CL				

Issue:

Following are the observations in the IRR sheet,

- According to the additionality tool "Calculate the suitable financial indicator for the proposed CDM project activity and, in the case of Option II above, for the other alternatives. Include all relevant costs (including, for example, the investment cost, the operations and maintenance costs), and revenues (excluding CER revenues, but possibly including inter alia subsidies/fiscal incentives,9 ODA, etc., where applicable)".
- Why is the additionality of both instances not provided separately? Both have separate thresholds (<60,000 tCO2e) and are considered different activities. How is it considered appropriate to combine the investment analysis of the two activities?
  Under section 3.5 of the joint PD-MR, PP has stated *"Therefore, to reduce the high upfront costs of the LEDs to the customers, the LEDs are sold at MRP in instalments on loan'*.

Action Item:

- How the rate mentioned under Cell C8 in 'Summary' worksheet has been confirmed? PP is requested to clarify why CER revenues are included as part of the analysis, even though the tool requires it to be included. Same goes for the validation verification and related costs.
- PP shall clarify the reason for not including both instances separately.
- PP shall clarify how many installments over what period? Are these installments accompanied by any interest? Please indicate where these details are provided.

Program rule:

VCS joint PD-MR template guidelines v4.2

Project participant response	Date : 12/07/2023

- Sale revenue is taken as per the current market rate of carbon credits. MEC has shown NPV for both scenarios after considering ER's revenue and without considering the same.
- At the time of investment decision, we intended to implement both the batches and thus the sales were considered accordingly. The same has now been mentioned in the joint PD-MR.
- The LEDs are sold to the customers at MRP but the payment by customer is made in installments, at no interest, on loan.

Documentation provided by project participant
Revised IRR sheet

VVB assessment	Date: 13/07/2023

• The justification provided by the PP was found to be appropriate as the revenue from sales was calculated using the price of carbon credits on the market at the time. After taking ER's revenue into account and without doing so, PP has given NPV for both scenarios. CLOSED. • The justification provided by the PP was found to be appropriate as the time of investment decision, both the batches have been implemented by the PP and thus the sales were considered accordingly. The same has now been mentioned in the joint PD-MR and found to be correct. CLOSED. • The LEDs are sold to the customers at MRP but the payment by customer is made in installments, at no interest, on loan which has been verified during the on-site audit and found to be appropriate. CLOSED. Hence, CL 04 is closed.

Table 3.CAR from this joint validation and verification

CAR ID	01	**Section no.**	3.1	**Date :** 30/05/2023
Description of CAR				
Issue: In section 1.1 of the joint PD-MR, the project proponent has provided the summary description of the project not more than one page which is not in line with the VCS joint PD-MR template guidelines v4.2. Also, PP has not included details on project's expected GHG emission reductions or removals, estimate of annual average and total GHG emission reductions or removals and scenario existing prior to the implementation of the project. **Action Item:** PP shall include the above-mentioned details and restrict the summary description of the project to one page. **Program rule:** VCS joint PD-MR template guidelines v4.2				
Project participant response				**Date :** 04/07/2023
Section 1.1 has been revised and all the details are in line with the VCS joint PD-MR template guidelines v4.2.				
Documentation provided by project participant				
Revised joint PD-MR				
VVB assessment				**Date:** 10/07/2023
The revised joint PD-MR has been reviewed and found that the project proponent has included the expected GHG emission reductions or removals, estimate of annual average and total GHG emission reductions or removals and has restricted the description of the summary to one page in line with the VCS joint PD-MR template guidelines v4.2 which is verified from the ex-ante ER sheet and found to be correct. Hence, CAR 01 is closed.				

CAR ID	02	**Section no.**	3.1	**Date :** 30/05/2023
Description of CL				

Issue:

- The eligibility of the project mentioned under section 1.3 is not in line with the latest VCS Standard v4.4.
- In section 1.4 and 3.2 of the joint PD-MR, point 1(g) and point 7 of the eligibility criteria for inclusion of VPAs stated is not in line with the applied methodology which also mentions the procedures to eliminate double counting.
- In section 1.4 of the joint PD-MR, point 1(g) of the eligibility criteria for inclusion of VPAs, it has been mentioned that the project activity instance is a 9W inverter LED whereas in the 'Service level configuration' worksheet of the ex-ante ER sheet, the PI also includes 12W LED which has also been mentioned under section 1.11 of the joint PD-MR.

Action Item:

- PP shall revise the eligibility of the project in accordance with the latest VCS standard v4.4 and include all the points mentioned in Para 2.1.3 of the standard.
- PP shall include the eligibility criteria for inclusion of VPAs in line with para 43 of the applied methodology and incorporate the compliance and justification in context with double counting.
- PP shall include both the LEDs wattage which has been distributed and installed under the project activity instance.

Program rule:

VCS Standard v4.4, AMS-II.C v15.0

Project participant response	**Date :** 04/07/2023

- The section 1.3 has been revised in the joint PD-MR and now it is in line with the latest VCS standard v4.4.
- Sections 1.4 and 3.2 of the joint PD-MR have been revised to be in line with the applied methodology.
- The eligibility criteria point 1(g) has been revised to include the criteria met for both PA batch-1 and PA batch-2.

Documentation provided by project participant

Revised joint PD-MR

VVB assessment	**Date:** 10/07/2023

- The revised joint PD-MR has been reviewed and found that the PP has updated the eligibility of the project which is now in line with the latest VCS Standard v4.4. CLOSED.
- PP has included the applicability criteria for double counting in line with the applied methodology in Section 1.4 and 3.2 of the joint PD-MR. VVB has verified the same from the agreements signed between the PP and the MFIs, the End user agreements and agreement between MFIs with the LED manufacturers which states that they will not claim carbon credits and ownership of these credits is with PP. Also, declaration was also provided by the PP which states that they will not claim ERs under any other registry or programme which was found to be correct. CLOSED.
- PP has included both LEDs wattage i.e., 9W and 12W in the revised joint PD-MR which has been distributed and installed under the PAI batch 1 and PAI batch 2 respectively and found to be appropriate. CLOSED.

Hence, CAR 02 is closed.

CAR ID	03	**Section no.**	3.1	**Date :** 30/05/2023
Description of CL				

Issue:

- In section 1.11 of the joint PD-MR, the project proponent has not stated the average lifetime of the LED and information on the number of bulbs PP intends to replace.
- PP has mentioned the heading of Table 1 "Technical specification of project lamps and comparison with baseline lamps" but PP has not included the comparison of the project lamps with the baseline lamps.
- It has been stated 'mentioned in section 1.11 above' under section 1.12 of the joint PD-MR, - however it has been observed that the details have not been provided under the above section.
- PP has not provided any description for the supply chain (scope 3) emissions under section 1.16.3 of the joint PD-MR.

Action Item:

- PP shall include the age and average lifetime of the LED based on the manufacturer's specifications and industry standards and the information on number of bulbs they intend to replace.
- PP shall include the comparison of the project lamps with the baseline lamps.
- PP shall include further information or details on the project location under section 1.12 of the joint PD-MR.
- PP is requested to provide the details of the Supply chain emissions in accordance with the VCS template guidelines v4.2 and provide evidence of the same.

Program rule:

VCS joint PD-MR template guidelines v4.2

Project participant response	**Date :** 04/07/2023

- The average lifetime of the LED has been included in the PD-MR based on manufacturer specifications. Further, each LED shall replace equivalent lumen (100% to 150% service level) ICLs. The information has been updated in the revised PD-MR.
- The heading of Table 1 has been revised as per the contents.
- The location details have been updated in section 1.12 of the joint PD-MR.
- As per the latest clarification to VCS Standard it is not mandatory to fill in the section until further notice in next update to Standard on 01/01/2024.

Documentation provided by project participant

Revised Joint PD-MR

VVB assessment	**Date:** 10/07/2023

- The average lifetime of the LED is 25,000 hours which has been verified from the manufacturer's specifications and found to be correct. Moreover, it has also been mentioned in the joint PD-MR that each LED will be replaced by the ICLs having equivalent lumen which will ensure service level between 100% to 150% in line with the applied methodology which was found to be appropriate. CLOSED.
- The heading of Table 1 has been revised by the PP to "Technical specification of project lamps" which was found to be appropriate. CLOSED.
- A clarification document to VCS Program Rules and Requirements dated 31/05/2023 states that *"Verra is delaying the effective date for the Scope 3 emissions double claiming provisions in Sections 3.23.7, 3.23.8, and 3.23.9 of the VCS Standard, v4.4, previously set at 1 July 2023."* Also, it has been clarified that Verra will publish the next Program update whose effective date will be 01/01/2024. Hence, it is not mandatory for the PP to fill section 1.16.3 of the joint PD-MR until 01/01/2024. CLOSED.

  Hence, CAR 03 is closed.

CAR ID	04	**Section no.**	3.1	**Date :** 30/05/2023

Description of CL	
Issue: • In section 1.17.2 of the joint PD-MR, the column 'Net Impact on SDG Indicator' of Sustainable Development Contributions has not been mentioned in accordance with the VCS template guidelines. • Under column 'SDG Indicator' for SDG 13, it has been mentioned 'Quantity of emission reductions achieved from the project activity'. However, VCS template guidelines states to use indicator **'Tonnes of greenhouse gas emissions avoided or removed'**. • Under column 'SDG Indicator' for SDG 7, it has been observed that SDG target has been mentioned instead of indicator. • PP has provided the total combined operational LEDs of project activity batch 1 and batch 2 under column 'current project contributions' for SDG 7. • The SDG indicator text for SDG 8 was found to be inconsistent with its corresponding number. *1)* **Action Item:** • The project's contribution to the SDG indicator has to be indicated i.e., **'implemented activities to increase or decrease'** in line with the VCS template guidelines. PP is requested to include the details as mentioned in VCS template guidelines. • PP shall include the correct SDG indicator in line with the VCS template guidelines which states *"While climate change and mitigation activities relate to SDG 13, they do not align with any SDG 13 target. For climate change mitigation impacts, write "13.0" in the SDG target column and use the indicator "Tonnes of greenhouse gas emissions avoided or removed"*. • PP shall incorporate the correct SDG Indicator for SDG 7 under column SDG Indicator'. • PP shall provide the details of the operational LEDs of batch 1 and batch 2 separately. • PP shall provide the correct SDG indicator and its description. PP is requested to refer the link provided below: https://unstats.un.org/sdgs/indicators/Global%20Indicator%20Framework%20after%202023%20refinement_Eng.pdf **Program rule:** VCS joint PD-MR template guidelines v4.2	
Project participant response	**Date :** 04/07/2023
• In section 1.17.2 of the joint PD-MR, the column 'Net Impact on SDG Indicator' of Sustainable Development Contributions, has been revised and updated in accordance with VCS template guidelines. • The indicator for SDG 13 has been revised and updated in PD-MR in accordance with VCS template guidelines. • SDG 7 has been revised and in line with VCS template guidelines. • The details of the operational LEDs of batch 1 and batch 2 have now been provided separately in the revised PD_MR • The SDG indicator for SDG 8 has been revised in the revised PD-MR	
Documentation provided by project participant	
Revised joint PD-MR	
VVB assessment	**Date:** 10/07/2023

• The revised joint PD-MR has been reviewed and found that the project's contribution to the SDG indicator has now been correctly stated in line with the VCS template guidelines v4.2. CLOSED. • The revised joint PD-MR has been reviewed and found that the SDG indicator for SDG target 13 has now been correctly stated as 'Tonnes of greenhouse gas emissions avoided or removed' in line with the VCS template guidelines v4.2. CLOSED. • The revised joint PD-MR has been reviewed and found that the SDG indicator has not been mentioned under the 'SDG indicator' column instead SDG target has been provided. PP shall incorporate the correct SDG Indicator for SDG 7 under column SDG Indicator'. OPEN. • The revised joint PD-MR has been reviewed and found that the project proponent provided details of the operational LEDs of batch 1 and batch 2 separately. However, the value of no. of LEDs operational under batch 1 was found to be inconsistent with the 'SDG' worksheet cell Y4&5 of the "ER Calculation sheet_Instance 1 -20230707". OPEN. • The revised joint PD-MR has been reviewed and found that the SDG indicator mentioned for SDG 8 is still inconsistent with the official list of SDG Targets and Indicators. Also, in line with the VCS joint PD-MR template guidelines v4.2, PP shall mention the no. of jobs created under the current monitoring period under column 'Current Project Contributions'. OPEN. • Under section 1.17.1 of the joint PD-MR, PP shall provide details for the following targeted SDGs: Approach, Relevant SDG indicator, Available data and Monitoring requirements. The following details have been mentioned under section 1.17.2 of the joint PD-MR instead of this section. PP is requested to take corrective action against section 1.17.1. OPEN. • In line with VCS joint PD-MR template guidelines v4.2, PP shall provide a brief summary of project activities implemented during the MP that result in SD contributions as well as explanation of how project activities result in SD contributions which has been described in Table 1 of the document under section 1.17.2 of the joint PD-MR. OPEN. Hence, CAR 04 remains open.
Project participant response **Date :** 11/07/2023
• The correct SDG indicator for SDG 7 has been incorporated in the SDG indicator column of revised PD-MR. • The values of the no. of LEDs operational under batch 1 and 2 have been made consistent with the ER sheet in the revised PD-MR. • The indicators mentioned for SDG 8 is project specific indicator as per VCS PD-MR template "Where a project's self-defined measure for tracking a benefit does not align with an official SDG indicator, do not provide an indicator number. Instead, write a project-specific indicator that relates to the most appropriate SDG target". • The details of the targeted SDGs: Approach, Relevant SDG indicator, Available data and Monitoring requirements has now been mentioned in section 1.17.1 of the revised PD-MR. • The summary of project activities implemented during MP that result in SDG contributions has now been added to revised PD-MR.
Documentation provided by project participant
Revised joint PD-MR
VVB assessment **Date:** 12/07/2023

- The revised joint PD-MR has been reviewed and found that the SDG indicator has now been mentioned under the 'SDG indicator' column which was found to be correct. CLOSED.
- The revised joint PD-MR has been reviewed and found that the project proponent has provided details of the operational LEDs of batch 1 and batch 2 separately and the values were verified from the ER sheet which were found to be correct. CLOSED.
- The justification provided by the PP was found to be appropriate as SDG 8 has been considered in line with the VCS joint PD-MR template guidelines which states that PP can use a project specific indicator where the project's self-defined measure does not align with official SDG indicator. CLOSED.
- The revised joint PD-MR has been reviewed and found that PP has provided details for the following targeted SDGs: Approach, Relevant SDG indicator, Available data and Monitoring requirements under section 1.17.1 which was found to be appropriate. CLOSED.
- In line with VCS joint PD-MR template guidelines v4.2, PP has provided a brief summary of project activities implemented during the MP that result in SD contributions as well as explanation of how project activities result in SD contributions which has been described in Table 1 of the document and was found to be correct. CLOSED.

Hence, CAR 04 is closed.

CAR ID	05	**Section no.**	3.4.2	**Date :** 30/05/2023
Description of CL				

Issue:

Under section 3.2 of the joint PD-MR,

- The compliance of the applicability criteria 8 of the applied methodology has not been described briefly by the PP. It has been stated that the LED shall be used to replace the baseline lamps and has not outlined how the total light output of the project lamp is equal to or more than the baseline lamp's total light output.
- The compliance of the applicability criteria 9 and 12 of the applied methodology has not been described briefly. PP has reported the applicability criteria statement itself in the 'How the project instance comply' column.
- The applicability criteria stated in para 49 of the applied methodology is found to be missing.
- The values mentioned in the table for 'Number' and 'Total energy consumption' for both baseline and project lamps were found to be inconsistent with the ex-ante ER sheet provided.

Action Item:

- PP shall explain briefly how the light output of the baseline and project lamp has been determined in accordance with relevant national or international standards.
- PP shall mention the average lifetime of the project lamps as well as the relevant standard it has followed for the applicability criteria 9.
  PP shall briefly explain how applicability criteria 12 has been met. If there is any report of the grid which has been maintained by the PP, electricity meter records will be recorded or not at each HH.
- PP shall include the applicability criteria mentioned in para 49 of the applied methodology.
- PP shall revise the table in line with the ex-ante ER sheet.

Program rule:

VCS joint PD-MR template guidelines v4.2, AMS-II.C v15.0

Project participant response	**Date :** 11/07/2023

• The compliance to applicability criteria 8 of the applied methodology has been described in section 3.2 of the revised PD-MR • The applicability criteria 9 and 12 of the applied methodology has now been described in section 3.2 of the revised PD-MR • The applicability criteria as per para 49 of the applied methodology has now been added to the revised PD-MR • The table has been revised in the revised PD-MR which is now consistent with the ex-ante calculation sheet.
Documentation provided by project participant
Revised joint PD-MR
VVB assessment **Date:** 12/07/2023
• The compliance of the applicability criteria 8 of the applied methodology has now been described briefly by the PP. The light output of the baseline lamps has been determined using the applied methodology whereas the light output of the project lamps have been determined using the manufacturer's specifications which comply with the BIS/BEE standard and found to be correct. CLOSED. • The compliance of the applicability criteria 9 and 12 of the applied methodology has now been described briefly by the PP. The average lifetime of the project lamps has been taken into consideration 25,000 hours for both the PAIs which comply with the BIS standard. Also, for applicability criteria 12, PP will record whether the household has an electricity meter which is connected to national/regional grid where the project lamp has been distributed. VVB has verified the same with the relevant standards, meter records and interviews with end users during on-site audit and found to be appropriate. CLOSED. • The revised joint PD-MR was reviewed and found that the PP has included the applicability criteria of the applied methodology stated in para 49 which was verified during from the training records and from the interviews with the end-users during the on-site audit and hence found to be correct. CLOSED. • The revised joint PD-MR was reviewed and found that the PP has provided the calculations on the 'Total energy savings' of the project activity batch 1 and 2 whose values were verified from the ex-ante ER sheet and found to be correct. CLOSED. Hence, CAR 05 is closed.

CAR ID	06	**Section no.**	3.4.6	**Date :** 30/05/2023
Description of CL				
Issue: Under section 5.4 of the joint PD-MR, • PP has provided the equation used for calculating the emission reduction only in accordance with the applied methodology. However, the detailed calculation for estimating the emission reduction was found to be missing. • The table mentioned under this section is found to be inconsistent with the VCS joint PD-MR template v4.2. **Action Item:** • PP shall provide the detailed calculation for estimating the emission reduction in line with the VCS joint PD-MR template guidelines v4.2. • PP shall include the correct table in line with the VCS joint PD-MR template v4.2. **Program rule:** VCS joint PD-MR template guidelines v4.2, AMS-II.C v15.0				
Project participant response				**Date :** 04/07/2023

• A detailed calculation for estimating the baseline, project and emission reduction has now been included in section 5 of the revised PD-MR. • The table is revised and in line with the VCS joint PD-MR template v4.2
Documentation provided by project participant
Revised joint PD-MR
VVB assessment | **Date:** 10/07/2023
• The detailed calculation for baseline and project emissions have now been incorporated under section 5.1 and 5.2 of the joint PD-MR. The calculations have been reviewed from the ex-ante ER sheet and found to be correct. CLOSED. • The project proponent has now included the correct table for representing the values of the ERs estimates in line with the VCS joint PD-MR template v4.2. CLOSED. Hence, CAR 06 is closed.

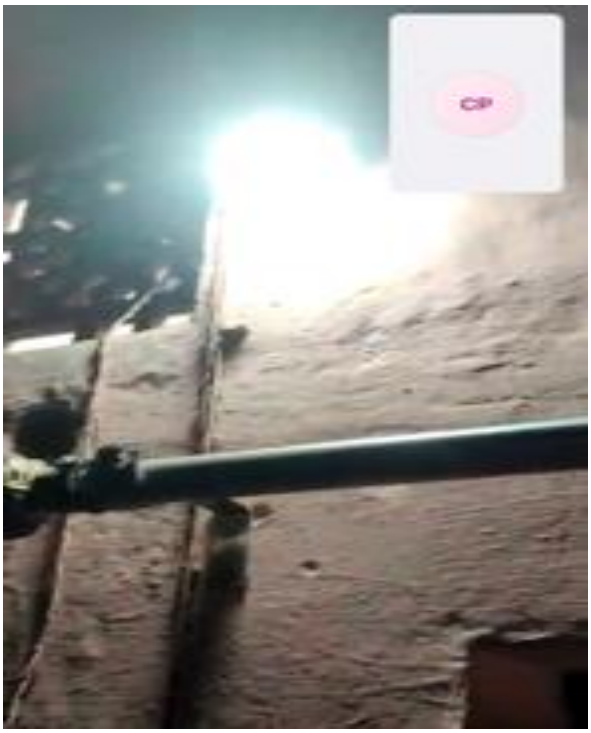
CAR ID	07	**Section no.**	4.1	**Date :** 10/07/2023
Description of CL				
Issue: Following observations were made in worksheet 'Bihar' of the ER Calculation sheet for PAI-1 and PAI-2, • Under Cell C7, the model of the LED which has been distributed under the PAI-1 has not been mentioned. The same has been found in all other states' sheets. • The calculation mentioned in Cell D17 & E17 is for the parameter $E_{BL,y}$ in accordance with equation 2 of the applied methodology. Also, in Cell C17 the description for the parameter has been stated as 'Total energy savings.' • The equation used for calculating the ERs in Cell D18 and E18 is not in accordance with para 38 of the applied methodology. • The baseline emissions and project emissions calculations have not been provided under 'ER LED Summary' worksheet of PAI-1 and PAI-2. **Action Item:** • PP shall incorporate the name of the model of the technology used for PAI-1 in all the sheets. • PP shall correct the notation as well as description of the parameter $E_{BL,y}$ in respective sheets of all states. Also, the total energy savings notation and calculation shall also be depicted for all the states. • PP shall apply correct equation in line with para 38 of the applied methodology. • PP shall provide the baseline emissions and project emissions calculations along with the net emission reduction in the ER sheet. **Program rule:** VCS joint PD-MR template guidelines v4.2, AMS-II.C v15.0				
Project participant response				**Date :** 11/07/2023
• The blank section of model name has been removed from the revised ER calculation sheets. • The correct notation for the parameter $E_{BL,y}$ has been added to the respective sheets of all states. • The equation has been applied in accordance with the applied methodology and revised PD-MR. • The baseline and project emissions have now been added to revised ER sheets.				
Documentation provided by project participant				
Revised ER sheets				
VVB assessment				**Date:** 12/07/2023

• The model of the LED which has been distributed under the PAI-1 has now been removed by the PP which was made consistent throughout all the States worksheet in PAI-1 and PAI-2 of the ER sheet. CLOSED. • The revised ER sheets of both PAI-1 and PAI-2 were reviewed and found that PP has corrected the notation and description of the parameter $E_{BL,y}$ to the respective sheets of all states and the equations used for calculating its value was found to be appropriate. CLOSED. • The revised ER sheets of both PAI-1 and PAI-2 were reviewed. The equations for calculating the ERs were in line with the applied methodology which was found to be appropriate. CLOSED. • PP has now included the baseline emissions and project emissions calculations along with the net emission reduction under 'ER LED Summary' worksheet of PAI-1 and PAI-2 of the ER sheets. The values and formula applied were found to be correct and appropriate. CLOSED. Hence, CAR 07 is closed. CAR 07 has been reopened during TR round. How the values of the parameter Oi have been adjusted for seasonal variations has not been demonstrated. Please clarify.
Project participant response **Date :** 13/07/2023
The project has used the data from Positional Astronomy Centre to calculate daylight hours in each of the states for the remaining 9 months where run time meter data is not available. Using the 90-day run time meter survey data and day light hours for each state the average operating hours for a lamp for each state are calculated. A detailed calculation sheet has been submitted to VVB. The same sentence has been incorporated in the joint PD-MR.
Documentation provided by project participant
-
VVB assessment **Date:** 13/07/2023
The seasonal variations calculations have been taken from the 90-day run time meter survey data for each state which has been verified by the VVB. The value found has been found correct, justified and consistent. Hence, CAR 07 is closed.

Table 4.FAR from this joint validation and verification

FAR ID	NA	**Section No.**		**Date :** DD/MM/YYYY
Description of FAR				
NA				
Project participant response				**Date :** DD/MM/YYYY
NA				
Documentation provided by project participant				
NA				
VVB assessment				**Date:** DD/MM/YYYY
NA				

APPENDIX V: PHOTOGRAPHS

Remote Audit	
	
Project LED of 9W	LED in operation
	
Baseline Bulb found during on-site visit	Run time meter for determining operating hour