



44 MW BUNDLED WIND POWER PROJECT IN MAHARASHTRA MANAGED BY ENERCON INDIA LIMITED.



Document Prepared by Earthood Services Private Limited

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Summary:

Earthood Services Private Limited (hereafter referred to as ESPL) has been contracted by Wind World (India) Ltd. to conduct the verification of the project - “44 MW Bundled Wind Power Project in Maharashtra managed by Enercon India Limited.”, VCS ID 489 regarding the relevant requirements of VCS programme guidelines and standard (VCS standard version 4.2, & VCS program guide version 4.1). Relevant requirements of the UNFCCC for CDM project activities, as well as criteria for consistent project operations, monitoring and reporting has been applied for verification.

The project activity consists of the installation of 55 WTGs of capacity 800 kW each. The electricity generated from these windmills is being supplied to Maharashtra State grid which is an integral part of Indian Grid. The equivalent amount of electricity would have been generated through fossil fuel fired power plants connected to Indian Grid resulting in higher GHG emissions in absence of the project activity.

The verification includes confirming the implementation of the monitoring plan of the registered VCS PD and MR (VCS ID 489) and the application of the monitoring methodology as per ACM0002: Grid-connected electricity generation from renewable sources, Version 17.0.

During the current monitoring period from 01/01/2021 to 31/12/2021 (First and last date included) the project activity has supplied 58,486.58 MWh of electricity, and thus contributing to 57,182 tCO_{2e} of GHG reductions.

The verification consisted of three phases: a. Desk review of the project; b. Follow-up remote audit; c. Resolution of outstanding issues and issuance of the final verification report and opinion. The overall verification, from Contract Review to Verification Report & Opinion, was conducted following ESPL's internal quality procedures.

A risk-based approach has been followed to perform this verification. During verification, 01 Corrective Action request (CARs), 00 Forward Action request (FARs), and 03 Clarification request (CLs) were raised and successfully closed.

Resolution of outstanding issues and issuance of the final verification report and opinion. The overall verification, from Contract Review to Verification Report & Opinion, was conducted following ESPL's internal quality procedures.

ESPL confirms that the project is implemented in accordance with the registered VCS PD & MR. The monitoring system is in place and the emission reductions are calculated without material misstatements. Our opinion relates to the project's GHG emissions, and the resulting GHG emission reductions reported and related to the valid and registered project baseline and monitoring and its associated documents. Based on the information seen and evaluated we confirm the emission reductions from the project activity "44 MW Bundled Wind Power Project in Maharashtra managed by Enercon India Limited." During the period 01/01/2021 to 31/12/2021 amount to 57,182 tCO_{2e}

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1 INTRODUCTION

1.1 Objective

Earthood Services Private Limited (ESPL) has been contracted by Wind World (India) Ltd., to undertake the verification of the renewable energy project titled “44 MW Bundled Wind Power Project in Maharashtra managed by Enercon India Limited.” (VCS ID-489). The verifiers have reviewed the GHG data collected to date for the monitoring period from 01/01/2021 to 31/12/2021 (both days included) covered in this verification. The objective of this verification is a thorough and independent assessment of registered project activities against the applicable VCS requirement by the VVB. The verification process shall determine whether the proposed project activity complies with the requirements of latest VCS guidelines, applicability conditions of the selected methodology, relevant host country regulations and guidance issued by the VCS Board.

1.2 Scope and Criteria

The scope of the verification is to establish/verify that:

- The appropriate VCS-MR form (and other templates) was used and correctly filled up; (as per (<https://verra.org/project/vcs-program/rules-and-requirements>))
- The project activity is in accordance with all relevant host country criteria (India).
- The project activity is in accordance with VCS standard 4.2/13/ and VCS program guide 4.1/14/.
- The project activity falls under Sectoral Scope: 01 - Energy industries (renewable / non-renewable sources); Project Type: I - Renewable Energy Projects.
- The project activity is in accordance with conditions of the latest version of applied methodology ACM0002: Grid-connected electricity generation from renewable sources, Version 17.0/08/.
- The project is not a grouped project as well as a non- AFOLU project.

The verification of the project activity is based on the VCS-PD and estimated GHG emission reduction calculations.

1.3 Level of Assurance

The level of assurance of the verification report falls under reasonable assurance engagements. Reasonable assurance is a high level of assurance regarding material misstatements, but not an absolute one.

Reasonable assurance includes the understanding that there is a remote likelihood that material misstatements will not be prevented or detected on a timely basis. To achieve reasonable assurance, the auditor needs to obtain sufficient appropriate audit evidence to reduce audit risk to an acceptably low level. This means that there is some uncertainty arising from the use of sampling, since it is possible that a material misstatement will be missed.

The evidence used to achieve a reasonable level of assurance is specified in section 2.3 and 2.4 of this report.

1.4 Summary Description of the Project

The project activity involves electricity generation by wind electric convertors and supplying the generated electricity to the integrated Indian grid. The project being a renewable energy generation activity, it leads to removal of fossil fuel dominated electricity generation. The Project activity is located in Kadvekhurd, Bhambarwadi, Panchpatta sites across Satara, Sangli, Nasik, and Ahmednagar Districts in the state of Maharashtra in India.

The project activity consists of the installation of 55 WTGs of capacity 800 kW each invested by 29 investors. The electricity generated from these windmills is being supplied to Maharashtra State grid which is integral part of Indian Grid. The equivalent amount of electricity would have been generated through fossil fuel fired power plants connected to Indian Grid resulting in higher GHG emissions in absence of the project activity. Hence generation of power through the project activity contributes to GHG emission reductions. The project activity is already commissioned, and it is found to be running satisfactorily.

The WTGs have been commissioned between 07/02/2006 and 10/12/2008. The same was verified against the registered VCS PD /01/ and subsequent validation report for crediting period renewal/2/. The net electricity supplied by the project activity during the monitoring period is 58486.58 MWh and the emission reductions from the project activity during the period 01/01/2021 to 31/12/2021 (including both days) amount to 57,182 tonnes of CO₂e.

2 VERIFICATION PROCESS

The registered VCS project is undergoing Sixth verification of the second crediting period, the approach adopted to ensure the quality of emission reductions is described in the following sections.

2.1 Method and Criteria

The verification approach consists of two phases.

In the first phase, ESPL completed a strategic review and risk assessment of the project's activities and processes in order to gain a full understanding of:

- Activities associated with all the sources contributing to the project emissions and emission reductions, including leakage if relevant
- Protocols used to estimate or measure GHG emissions from these sources
- Collection and handling of data
- Controls on the collection and handling of data
- Means of verifying reported data; and
- Compilation of the verification Report.

At the end of this phase, ESPL produced a Verification Checklist which, based on the risk assessment of the parameters and data collection and handling processes for each of those parameters, describes the verification approach and the sampling plan.

In the second phase using the Verification checklist, ESPL verified the implementation of the monitoring plan and the data presented in the VCS MR/03/ for the period in question. These involved interviews of project proponent's representative and a desk review of the Monitoring Report. This verification report describes the findings of this assessment.

2.2 Document Review

The verification is performed primarily as a document review of the registered VCS PD and Validation report and associated documents as stated in detail in appendix 1 of this document. The assessment is performed by a verification team using a protocol. The cross checks between information provided in the Monitoring report, VCS PD and information from sources other than those used, if available, the team's sectoral or local expertise and, if necessary, independent background investigations.

2.3 Interviews

Due to the current situation with the global COVID-19 pandemic scenario physical site inspection is not done for the verification. Although domestic travel has resumed in India, it is still not recommended until necessary and considering health and safety a top priority, physical site visit for verification audit is not conducted. Furthermore, as per the Section 4.1.2 of the VCS Standard, v4.2, it is not mandatory to conduct the on-site visit by VVB for verification. However, the remote audit via video conferencing was conducted by alternate means and representatives of the PP were also interviewed on 14/03/2022 i.e., personnel responsible for monitoring of the project activity, data collection and management, and QA/QC procedure. The details of the people interviewed are mentioned in the table below:

Name of Person(s)/Designation	Affiliation	Topics Discussed
Poorvi Joshi Shenoy	Project Consultant	The topics covered during interview ranges from general features and implementation of project to technical details of the project like calibration details, monitoring and measuring system and data collection, recording and archiving procedures. - Project implementation, start date as per the VCS requirements. - Electricity Generation Records (monthly energy statements, Invoices) - Reliability & accuracy of readings considered for emission reduction calculations, Calibration procedure - Monitoring and measuring system - Collection of measurements - Observations of established practices - Data Verification of monitoring parameters - QA/QC procedures, data management, internal audits to maintain data quality & reliability, maintenance Practices. - Consideration of monitoring period, monitoring methodology, project documentation and emission reduction calculations.
Firoj Shikalgar	Sr. Manager of the plant (Site in-charge) (Wind World (India) Ltd.)	

		- Monitoring and measuring system Collection of measurements - Observations of established practices - Data Verification of monitoring parameters - QA/QC procedures, data management, internal audits to maintain data quality & reliability, maintenance Practices.
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2.4 Site Inspections

As discussed in the above section, physical site inspection is not done for the current verification. However, to achieve a reasonable level of assurance, the assessment team has followed the alternative means of remote interview via video conferencing on 14/03/2022 with PP representatives to substantiate the verification criteria as described in the below table:

Assessment Criteria	Means of verification/source documents	Assessment opinion
Description of project activity	Previous VCS verification report/2/ Virtual interviews with site personnel and PPs representatives on 14/03/2022^{/15/}.	The information's with reference to project capacity, technology, plant equipment's and commissioning dates as provided in section 1.1 of MR are found consistent with the documents and implementation on site.
Compliance of the project implementation with the registered Project Design Document	Monthly JMRs issued /07/ Geographical coordinates of project activity verified through Google earth (https://earth.google.com) Previous VCS verification report /2/ Virtual interviews with site personnel and PPs representatives on 14/03/2022^{/15/}.	Monthly Credit Notes and JMRs issued by DISCOMs indicate the following information: Identification of substation and grid connectivity to which the project is connected, Capacity and name of project investors. Location of project is verified through GPS Map and found consistent with registered VCS PD. All the information's regarding the project implementation as discuss above are further verified through VCS PD and found consistent in MR.

Compliance of the registered monitoring plan with applied methodologies and standardized baselines	Virtual interviews with site personnel and PPs representatives on 14/03/2022. Monthly JMRs issued /07/ Invoices raised by project developer to respective state utility /06/.	The organizational structure, responsibilities and competencies of the personnel confirmed through interview of site in-charge and project proponent representative. Frequency of monitoring of parameters listed under approved monitoring plan is verified through JMRs /Invoices. The methods used for measuring, recording, storing, aggregating, and reporting the data on monitored parameters are verified virtual conversations with site personnel and records of monitoring and photographs of site machines and meters installed. Procedure for data uncertainty, emergency preparedness, roles and responsibility, operational and management structure are mentioned in the MR is confirmed through remote site visit and found satisfactory
Compliance with the calibration frequency requirements for measuring instruments	Calibration certificates of meters installed at all three locations/05/ Central Electricity Authority (Installation and Operation of Meters) Regulations /12/	Calibration frequency and energy meter specifications (Sr. No, make accuracy class) is verified through calibration certificates and further verified through photographs and found consistent.
Assessment of data and calculation of emission reductions or net removals	Monthly JMRs issued /07/ Invoices raised by project developer to respective state utility /07/. CEA CO2 Baseline Database for the Indian Power Sector /09/	Monthly values of monitoring parameter used in ER calculation are verified through Credit Notes/JMRs and cross verified with the respective invoices. Methods, formulae and emission factor for calculating baseline

	Previous VCS verification report /02/.	emissions have been followed are in accordance with the applied methodology and as described in the approved VCS verification report /02/.
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It is noteworthy that no sampling plan for verification is applied as 100% data is verified for the current monitoring period. Most of the reference document referred by the assessment team (above table) are either issued /endorsed by the state utility (MSEDCL), an external government agency, hence is deemed authentic.

The assessment team has verified all the primary supporting related to operations, quality and generation of data during the monitoring period like share certificate issued by Government authority, invoices raised by PP, calibration certificate, video interview with onsite person etc. The photographs were only used as means of secondary cross check of the information verified from primary sources. Also, this is the sixth monitoring period of the second crediting period. So, the information regarding project capacity commission and monitoring system are already verified in previous monitoring report which are also cross checked with previous report. Thus, a reasonable level of assurance is achieved.

2.5 Resolution of Findings

The objective of this step is to identify, discuss and conclude on the issues related to the monitoring, implementation and operations of the registered project activity that could impair the capacity of the registered project activity to achieve emission reductions or influence the monitoring and reporting of emission reductions. This is done based on the desk review and interaction with site personnel over phone. The verification team prepares and/or updates a verification protocol (internal document) that records the conformities and non-conformities, which may be of following types:

- CAR (Corrective Action Request) is raised if one of the following occurs:
 - Non-compliance with the monitoring plan, the methodology or the standardized baseline are found in monitoring and reporting and has not been sufficiently documented by the project participants, or if the evidence provided to prove conformity is insufficient
 - Modifications to the implementation, operation and monitoring of the registered project activity has not been sufficiently documented by the project participants
 - Mistakes have been made in applying assumptions, data or calculations of emission reductions that will impact the quantity of emission reductions
 - Issues identified in a FAR during validation to be verified during verification or previous verification(s) have not been resolved by the project participants
- Clarification request (CL) is raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met. All CARs and CLs raised by the ESPL during verification shall be resolved prior to submitting a request for issuance.

- FAR (Forward Action Request) is raised during verification if the monitoring and reporting require attention and/or adjustment for the next verification period. All the findings that are raised and communicated to project participant during the verification are included under Appendix 3. The section also includes the response, if provided, by the project proponents and an assessment by the verification team if it was closed out or otherwise.

A total of 3 CLs and 1 CAR were raised and closed successfully. Please refer to Appendix 3 for the detailed closure of findings.

2.5.1 Forward Action Requests

This is the Sixth periodic verification of the project activity under the second crediting period and there are no open FARs from previous verification or validation applicable for the current monitoring period.

No FAR has been raised during the current monitoring period.

2.6 Eligibility for Validation Activities

Not applicable.

3 VALIDATION FINDINGS

Not applicable.

3.1 Participation under Other GHG Programs

The project is registered under VCS only (VCS ID-489).

The first crediting period for the project was from – 01/04/2006 to 31/03/2016

Crediting period	Monitoring Period	VCUs Issued (tCO ₂ e)	Web Link
1 st crediting period	01/04/2006 to 31/05/2009 (1 st MP)	122,200	https://registry.terra.org/app/projectDetail/VCS/489
	01/06/2009 to	98,873	https://registry.terra.org/app/projectDetail/VCS/489

	30/09/2010 (2 nd MP)		
	01/10/2010 to 30/11/2011 (3 rd MP)	79,803	https://registry.terra.org/app/projectDetail/VCS/489
	01/12/2011 to 30/09/2012 (4 th MP)	64,008	https://registry.terra.org/app/projectDetail/VCS/489
	01/10/2012 to 30/04/2013 (5 th MP)	23140	https://registry.terra.org/app/projectDetail/VCS/489
	01/05/2013 to 31/12/2013 (6 th MP)	66,077	https://registry.terra.org/app/projectDetail/VCS/489
	01/01/2014 to 30/09/2014 (7 th MP)	54,320	https://registry.terra.org/app/projectDetail/VCS/489
	01/10/2014 to 31/03/2016 (8 th MP)	79,384	https://registry.terra.org/app/projectDetail/VCS/489

2nd crediting period: 01/04/2016 to 31/03/2026

Crediting Period	Monitoring period	VCUs Issued (tCO ₂ e)	Web Links
2 nd crediting Period	01/04/2016 to 31/01/2017 (1 st MP)	38,362	https://registry.terra.org/app/projectDetail/VCS/489
	01/02/2017 to	42,985	https://registry.terra.org/app/projectDetail/VCS/489

	31/03/2018 (2 nd MP)		
	01/04/2018 to 31/10/2018 (3 rd MP)	39,287	https://registry.verra.org/app/projectDetail/VCS/489
	01/11/2018 to 31/12/2019 (4 th MP)	74,380	https://registry.verra.org/app/projectDetail/VCS/489
	01/01/2020 to 31/12/2020 (5 th MP)	44,197	https://registry.verra.org/app/projectDetail/VCS/489
	01/01/2021 to 31/12/2021 (6 th MP)	57,182 (to be issued)	(Currently undergoing verification)

In accordance with the VCS standard, section 3.4.4, it has been verified that the monitoring period of the project activity are distinct and there is no overlapping between the monitoring periods. All the monitoring period are issued in VCS.

The PP has submitted the declaration/11/ which states that the net GHG emission reductions generated by the project activity will not be used for compliance with any other emissions trading program or to meet binding limits on GHG emissions for the same monitoring period.

CL#02 was raised regarding the same and closed as the PP submitted the declaration.

3.2 Methodology Deviations

There is no methodology deviation identified during the current monitoring period.

3.3 Project Description Deviations

There is no project deviation identified during the current monitoring period.

However, the PP had considered a permanent deviation in previous monitoring period/2/ to change the calibration frequency of the meters. Periodically, during the course of verification, It was observed by the PP that the MSEDCL testing division, which in-charge of conducting calibration of the meters, does not conduct the meter testing as per the frequency mentioned in the VCS PD/01/.

The calibration is not under the purview of the PP and is performed by the MSEDCL Testing Division only in accordance with the PPA of the project investors. Therefore, the PP has implemented a new frequency as per the CEA notification dated 17 March 2006/12/ which confirms that energy meters test/calibration can be performed once in five years.

Since CEA is regulatory authority under central government and applies uniformly across all the states, the guidelines issued by them are found to be appropriate and as per the national standard. Based on the same, the PP has considered the calibration frequency of 5 years for all the project activity meters.

This is a permanent deviation taken during the previous monitoring period and was verified and accepted by the VVB. This deviation is also applicable for the current monitoring period is found to be in line with the VCS Standard/13/.

Thus, the verification team can confirm from the above data that the deviations taken during the previous monitoring periods do not have an impact on the current verification. Hence, it can be concluded that the approach followed by the PP is conservative and in line with the guidelines provided under paragraph 2, section 3.19.2 of VCS Standard/13/.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

This is the sixth verification for the project activity. The project activity has been commissioned and is operating satisfactorily. The same has been checked and verified during the remote site visit to the project activity and the generation records submitted through monthly credit notes issued by the state nodal agency. The commissioning of all the WTGs have been verified against previous verification and validation report, where the commissioning details were checked through commissioning certificates.

The name of investors and their respective capacity are checked with the credit notes and invoices for the project activity and found to be inline with the registered PD and information provided in the MR.

This proposed wind power project will reduce the GHG emissions generated by the current generation energy mix in India's Power Grid, which is dominated by fossil-fuel based grid connected power plants. The power generated through the proposed project activity being supplied to the Maharashtra state electricity grid, which is an integral part of the Indian grid.

The monitoring of the project activity is found to be in accordance with the monitoring methodology described in ACM0002, Version 17/08/. The monitoring mechanism is effective and reliable. During the audit, personnel involved at various levels of the operation of the project activity have been interviewed to confirm that the plant personnel are conscious of the importance of the monitoring activities. The on-site verification of the plant records also substantiate consistency in recording and reporting of monitored data.

The required monitoring systems have been installed and are operational. The meters comply with appropriate quality standards applicable for the used technology. The accuracy class of the meters installed for the project activity was verified against the registered VCS PD/01/ and VCS MR/03/. There was no major breakdown or shutdowns during the monitoring period which might affect the applicability of methodology or might cause material errors in emission reductions.

The monitoring plan of registered VCS PD/01/ includes the parameter

- Quantity of net electricity generation supplied by the project plant/unit to the grid in year y ($EG_{y,net}$)
- Quantity of electricity exported by the Project to the grid in year y ($EG_{export,y}$)
- Quantity of electricity imported by the Project from the grid in year y ($EG_{import,y}$)

Quantity of net electricity generation supplied by the project plant/unit to the grid in year y, is calculated as:

$$EG_{y,net} = (EG_{export,y} - EG_{import,y})$$

Electricity exported and imported by the project activity being measured by energy meters of accuracy class 0.2s located at the substations. These parameters are measured continuously and follows at least monthly recording. This is in line with methodology and is accepted.

Monthly values of $EG_{y,net}$ are obtained directly from the monthly credit notes issued by state utility (MSEDCL)/07/. The invoicing being done against electricity supplied by the project plant to the grid. The measurement results are cross checked with records of invoices, and it is in line with applied methodology. Thus, this parameter is considered in emission reduction calculations.

Joint Meter Reading is being taken jointly by the officials of state utility and project participant's representative on monthly basis and accordingly monthly credit notes is being prepared for each project investor/proponent. The monitoring methodology applies consistently the choice of the option selected for monitoring of baseline emissions. The monitoring plan provides procedures for the collection and archiving of all relevant data necessary for estimation or measuring the emission reductions within the project boundary.

The VCS MR/03/ has been reviewed to check that the procedure for data uncertainty, emergency preparedness, roles and responsibility, operational and management structure are mentioned in the MR. The monitoring plan completely describes all measures to be implemented for monitoring all parameters required. The monitoring plan described the positioning of the equipment. The information relating to the project implementation, provided in the Monitoring Report /03/ is consistent with that stated in the registered PD /01/. The data and variables provided in the monitoring report are the same as stated in the registered PD/01/. These details are also checked with actual implementation and monitoring procedures on site and found appropriate. Total emission reductions achieved under this monitoring period 01/01/2021 to 31/12/2021 (including both days) is 57,182 tCO₂e.

Assessment team concludes the following:

- a) There are no material discrepancies between project implementation and the project description provided in the registered PD/01/.
- b) The monitoring plan is implemented completely and monitoring system (i.e., process and schedule for obtaining, recording, compiling, and analysing the monitored data and parameters) is appropriate.
- c) There are no material discrepancies between the actual monitoring system, and the monitoring plan set out in the project description and the applied methodology/08/.
- d) The GHG emission reductions or removals generated by the project have not included in an emissions trading program or any other mechanism of environmental credits that include GHG allowance trading/11/.

- e) The project has not participated or been rejected under any other GHG programs since validation or previous verification.

4.2 Safeguards

4.2.1 No Net Harm

This project activity does not involve any negative environmental or socio-economic impacts, as the project activity involves generation of wind energy which is clean source of energy. Hence, no mitigation measures are required.

4.2.2 Local Stakeholder Consultation

The project activity undergoing sixth verification of second crediting period and local stakeholder consultation was appropriately conducted prior to validation as a way to inform the design of the project and maximize participation from stakeholders during the validation.

The project proponent has also established a mechanism for continuous stakeholder interaction and considering the grievance from local stakeholders on ongoing basis. The details for the same are provided under section 2.2 of the MR and verified during interviews of remote audit and grievance register/12/ maintained at site.

CL#03 was raised regarding ongoing local stakeholder consultations and was successfully resolved.

4.3 AFOLU-Specific Safeguards

Not applicable to the project activity.

4.4 Accuracy of GHG Emission Reduction and Removal Calculations

The project monitoring has been carried in accordance with the registered VCS PD/01/ and the monitoring report/03/. The monitoring plan laid in the registered PD/01/ is being followed at the site. The assessment team has verified the information flow (from data generation, aggregation, to recording, calculation and reporting for these parameters including the values) in the MR/03/.

The emission reductions are purely based on the net electricity generated and exported from the machines. PP has provided all the sufficient data for current monitoring period. The values of the parameter $EG_{y,net}$ used in deriving the GHG emission reduction could be very well correlated between the data sets and ER spreadsheet/04/ provided by PP. The net electricity to the grid (EG_y) by the project activity measured by state utility on monthly basis through dedicated metering system installed at site and recorded in the monthly credit notes provided to project proponents. Verification team has verified the monthly values of parameter ($EG_{y,net}$) as reported in the ER sheet with the source document (credit notes) and no discrepancy is observed, hence it can be confirmed that no manual transposition errors between data sets have been occurred. The verification of each monitoring parameter has been discussed later in section 4.5.

The calculation method and formulae used in calculating baseline emission is in compliance to the methodology used i.e., ACM0002 version 17.0/08/ and registered PD/01/. Since project activity is a wind power project, leakage emission and project emission has been considered as zero.

4.5 Quality of Evidence to Determine GHG Emission Reductions and Removals

The below tables describe how the parameter, that is to be measured according to the monitoring plan, has been verified to confirm that the actual monitoring complies with the monitoring plan, monitoring data has been thoroughly assessed and that the calibration requirements are met.

Parameter 1: Net electricity supplied to the grid by the project $EG_{y,net}$ (MWh)

Means of verification		
	Criteria/Requirements	Assessment/Observation
	Measuring /Reading /Recording frequency	The parameter is calculated and recorded on monthly basis. Net electricity supplied to the grid by the project is calculated as: $EG_{y,net} = (EG_{export} - EG_{import})$ Where, EG_{export} =Electricity exported to the grid by the project activity EG_{import} = Electricity imported from the grid by the project activity

	Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. The reporting frequency is in line with the monitoring plan as outlined in the registered PD/01/ and monitoring methodology/08/.
	Monitoring equipment	The net electricity supplied to the grid is calculated based on the electricity exported to the grid and imported from the grid. the electricity exported and imported are measured parameters and continuously monitored through energy meters. Energy meters of accuracy class 0.2s are used, (Calibration details of meter is provided separately in this section, under the heading "Calibration of meters") Thus, calculated net electricity supplied to the grid is issued to the project proponent/investors in form of Credit notes for every month, which is the primary source of record.
	Is accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	The accuracy of the monitoring equipment used to measure the input values used to calculate EG_{export} and EG_{import} is 0.2s, which is as per the registered PD/01/ which is as per the norm defined in the CEA regulation/12/.
	Is the accuracy valid for the entire measuring range or do different accuracy levels apply to	Yes. The accuracy of monitoring equipment"s is valid for the entire range.

	different measuring ranges?	
	Calibration frequency /interval:	Calibration frequency for energy meters used to measure input values of export and import is once in five years.
	Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, pending until the findings are closed or as per the manufacturer's specifications?	Yes. The calibration frequency is in line with the monitoring plan as outlined in the registered PD/01/.
	Is the calibration of measuring equipment carried out by an accredited person or institution?	Yes, the calibration is conducted by state utility which is authorised government agency to conduct the same as per PPA.
	Is(are) calibration(s) valid for the whole reporting period?	Yes, the calibration is valid for entire monitoring period.
	How were the values in the monitoring report verified?	The values in the monitoring report were verified from the monthly Credite Notes /07/. Final value of net electricity supplied to the grid by the project activity is verified as: 58486.58
	If applicable, has the reported data been cross-checked with other available data?	The monthly reported values of EG _y were further cross checked with the monthly invoices raised by the PP/07/ to state utility and found to be consistent.

	Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Yes, the data ensure correct transfer of data and reporting of emission reductions management. QA/QC processes are in place.
	In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	Not Applicable
Findings	No findings were raised related to this parameter.	
Conclusion	The parameter has been monitored appropriately, in accordance with the registered monitoring plan (as per measurement methods and procedures to be applied) and applied methodology. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan. The verification team is able to confirm that the project is implemented as per the registered PD and there is no discrepancy observed between the actual monitoring system and the monitoring plan set out in the registered PD and the applied methodology. The emission reduction calculation for the project activity is estimated based on the electricity supplied by the WTGs. Since 100% data was verified, the team can ascertain that the values taken for emission reduction calculation are free from material errors.	

Parameter 2: Electricity imported from the grid by the project activity in year y. EG_{import} , (MWh)

And

Parameter 3: Electricity exported to the grid by the project activity in year y, EG_{export} , (MWh)

Means of verification		
	Criteria/Requirements	Assessment/Observation
	Measuring /Reading /Recording frequency	The parameters for export to the grid and import from the grid are continuously measured by the electricity meters installed at the feeders of various substations of the project activity and recorded on monthly basis, The meters installed are tri-vector, bi-directional meters and both electricity export and import by the project activity are measured through the same meters. Thus, verification details for both the parameters are same.
	Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. The reporting frequency is in line with the monitoring plan as outlined in the registered PD/01/ and monitoring methodology/08/.
	Monitoring equipment	Energy meters of accuracy class 0.2s are used, (Calibration details of meter is provided separately in this section, under the heading "Calibration of meters")
	Is accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring	The accuracy of the energy meters is 0.2s, which is as per the registered PD/01/ which is as per the norm defined by the CEA/12/.

	equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	
	Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges?	Yes. The accuracy of monitoring equipment is valid for the entire range.
	Calibration frequency /interval:	Calibration frequency of the meters is once in 5 years as per the permanent deviation considered by the PP.
	Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, pending until the findings are closed or as per the manufacturer's specifications?	Yes. The calibration frequency is in line with the monitoring plan as outlined in the registered PD/01/.
	Is the calibration of measuring equipment carried out by an accredited person or institution?	Yes, the calibration is conducted by state utility which is authorised government agency to conduct the same as per PPA.

	Is(are) calibration(s) valid for the whole reporting period?	Yes, the calibration is valid for entire monitoring period.
	How were the values in the monitoring report verified?	The values in the monitoring report were verified from the monthly Credite Notes issued /07/. Verified value of the Electricity exported to the grid by the project activity during the monitoring period is verified as: 58557.64. Verified value of the Electricity imported from the grid by the project activity during the monitoring period is verified as: 71.06.
	If applicable, has the reported data been cross-checked with other available data?	The monthly reported values of export and export were further cross checked with the monthly invoices raised by the PP/07/ to state utility and found to be consistent.
	Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Yes, the data ensure correct transfer of data and reporting of emission reductions management. QA/QC processes are in place.
	In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	Not Applicable

Findings	No findings were raised related to this parameter.
Conclusion	These parameters have been monitored appropriately, in accordance with the registered monitoring plan (as per measurement methods and procedures to be applied) and applied methodology. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan. The verification team is able to confirm that the project is implemented as per the registered PD and there is no discrepancy observed between the actual monitoring system and the monitoring plan set out in the registered PD and the applied methodology. The emission reduction calculation for the project activity is estimated based on the electricity supplied by the WTGs. Since 100% data was verified, the team can ascertain that the values taken for emission reduction calculation are free from material errors.

Parameters fixed ex-ante:

Sr. No.	Parameter	Value	Assessment team remark
1.	EF _{grid,OM,y}	0.9941	These values are considered from the national CEA database of India and validated in the registered VCS PD. The values are appropriately considered as per the registered VCS PD. CEA database, Version 11, April 2016 (http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf)
2.	EF _{grid,BM,y}	0.9285	
3.	EF _{grid,CM,y}	0.9777	

Calibration of meters:

All the energy meters installed at respective sub-stations are of Elster make having accuracy class 0.2s. The installation and working conditions of the meters were checked through calibration certificates/5/, latest photographs were found to be satisfactory. Details of meters are provided in below table:

Substation Name	Feeder No	Project activity WTG connected	Meter Sr no	Calibration date/5/	Next due date for calibration
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Kadvekhurd	Single feeder	7 WTGs, 5.6 MW	4760188	13/08/2018	12/08/2023
Varekarwadi	Feeder – 1	2 WTGs, 1.6 MW	5269382	29/05/2018	28/05/2023
Bhambarwadi	Feeder – 1	5 WTGs, 4 MW	16595516	24/04/2018	23/04/2023
	Feeder – 3	13 WTGs, 10.4 MW	04862747	05/05/2019	04/05/2024
Panchpatta	Feeder – 1	11 WTGs, 8.8 MW	14831531	18/03/2019	17/03/2024
	Feeder – 4	6 WTGs, 4.8 MW	14831520	18/03/2019	17/03/2024
	Feeder – 5	2 WTGs, 1.6 MW	14831522	18/03/2019	17/03/2024
	Feeder – 6	9 WTGs, 7.2 MW	14831533	27/03/2019	26/03/2024

It is evident from the above table that calibration of all the existing meters was valid during the current monitoring period, hence no delay in calibration of meters identified. The CEA Notification No. 502/70/CEA/DP&D dated 17/03/2006 and its amendments Notified on 26/06/2010 No. 502/6/2009/DP&D/D-I /16/ which is considered as national standard, mentions that for voltage of 650 V up to 33 kV, 0.5s accuracy class or above is recommended. Hence, the accuracy classes of 0.2s for the energy meters installed at the project activity site are found to be appropriate.

The details of monitoring equipment are involved in the project activity and their calibration details/05/ are mentioned under Appendix-1 of the VCS MR/03/. The CEA Notification No. 502/70/CEA/DP&D dated 17/03/2006/16/ which is considered as national standard mentions that “All interface meters shall be tested at least once in five years.” Hence, the stipulated calibration frequency once in 5 years is appropriate.

In view of the above discussion the assessment team able to confirm that evidence used to determine the GHG reductions and removals are sufficient and appropriate with respect to quality and quantity.

GHG Calculations:

The emission reduction as per the applied methodology equals the baseline emissions (project emissions and leakage emissions for such project activities is considered zero). The formula provided for the calculation of baseline emissions is:

$$BE_y = EG_{BLy} * EF_{CO2,grid,y}$$

Where,

BE_y is the baseline emissions in year y, tCO_{2e}

EG_{BLy} is the quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{CO2,grid,y}$ is the CO₂ Grid Emission Factor in tCO_{2e}/MWh

$$\begin{aligned} \text{Therefore, the baseline emissions} &= 58,486 * 0.9777 \text{ tCO}_2\text{e/MWh} \\ &= 57,182 \text{ tCO}_2\text{e} \end{aligned}$$

The calculation of the net emission reduction achieved is done using the equation provided below:

$$\text{Net Emission reduction, } ER_y = BE_y - PE_y - LE_y$$

Where,

BE_y is baseline emissions in year y (tCO_{2e})

PE_y are project emissions in year y (tCO_{2e})

LE_y are leakage emissions in year y (tCO_{2e})

As per the applied methodology and registered VCS PD, the values of the $PE_y = 0$ and $LE_y = 0$,

Therefore,

$$\begin{aligned} \text{Net Emission Reductions} &= BE_y - 0 - 0 \\ &= 57,182 \text{ tCO}_2\text{e} \end{aligned}$$

The verification team confirms that appropriate methods and formulae for calculating baseline emissions have been followed. The assumptions, emission factors and default values that were applied in the calculations are justified. All the data were made available and have monitored as per required monitoring frequency. The means of verification for the values of parameters, used for baseline emission calculation, is described above.

In view of the above discussion the assessment team able to confirm that evidence used to determine the GHG reductions and removals are sufficient and appropriate with respect to quality and quantity.

4.6 Non-Permanence Risk Analysis

Not applicable for the project activity.

5 VERIFICATION CONCLUSION

Earthood Services Private Limited (ESPL) contracted by Wind World (India) Ltd., to perform the independent verification of the emission reductions for the VCS project activity “44 MW Bundled Wind Power Project in Maharashtra managed by Enercon India Limited.” (VCS ID- 489) in India for the monitoring period 01/01/2021 to 31/12/2021 as reported in the Monitoring Report Version 01.3 dated 06/12/2022.

It is our responsibility to express an independent verification statement on the reported GHG emission reductions from the project activity. ESPL commenced the verification on the basis of the baseline and monitoring methodology ACM0002 Version 17.0, the monitoring plan contained in the registered VCS PD Version 03, dated 01/02/2017, VCS guidelines version 4.1 and Monitoring Report Version 01.3 dated 06/12/2022 as per the process described under Section 2 of this report. ESPL verification approach is based on the understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. ESPL planned and performed the verification by obtaining evidence and other information and explanations that ESPL considered necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.

In our opinion the GHG emissions reductions reported for the project activity for the period 01/01/2021 to 31/12/2021 (both days included) are fairly stated in the Monitoring Report Version 01.3 dated 06/12/2022. The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology ACM0002, Version 17.0, and the VCS standard version 4.2.

Verification period: From 01/01/2021 to 31/12/2021

Verified GHG emission reductions and removals in the above verification period:

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net emission reductions or removals (tCO ₂ e)	GHG
2021	57,182	0	0	57,182	
Total	57,182	0	0	57,182	

The annual estimated emission reduction for this monitoring period is 75,368 tCO₂e. Whereas the actual emission reduction for this monitoring period is 57,182 tCO₂e. There

was decrease in generation as compared to the projected generation, which has led to 24.13% lower ERs as compared to the estimated value.



Approved by

Kaviraj Singh

Managing Director

Earthood Services Private Limited

Date: 13/12/2022

Place: Gurgaon, Haryana

APPENDIX 1: DOCUMENT REFERENCES

S.No	Title of Document	Version	Date
1.	Registered VCS PD	03	01/02/2017
2.	Previous VCS Verification Report	03.0Aa	14/09/2021
	Previous Validation report for crediting period renewal	02	22/02/2017
3.	VCS Monitoring Report	1.3	06/12/2022
4.	ER Spreadsheet (corresponding to the final monitoring report)	02	08/04/2022
5.	Certificates of Calibration for all the meters belonging to the project activity	-	Various
6.	Invoice issued by PP to state DISCOM for the monitoring period	-	-
7.	Monthly JMR and Credit notes issued by MSEDCL for the monitoring period	-	Monthly for the period 01/01/2021 to 31/12/2021
8.	"Grid-connected electricity generation from renewable sources", ACM0002	17.0	-
9.	CEA Database: CEA CO2 Baseline Database for the Indian Power Sector,	Version 11	-
10.	VCS webpage for the project, VCS ID 489; https://registry.verra.org/app/projectDetail/VCS/489	-	Last accessed on 28/03/2022
11.	Letter of declaration dated from PP regarding not having created or sought any other form of environmental credit for the same period	-	-
12.	Central Electricity Authority (Installation and Operation of Meters) Regulations Notified on 17/03/2006 <u>No. 502/70/CEA/DP&D</u> Amendments Notified on 26/06/2010 <u>No. 502/6/2009/DP&D/D-I</u>	-	-

S.No	Title of Document	Version	Date
	https://cea.nic.in/wp-content/uploads/2020/02/meter_reg.pdf		
13.	VCS Standard	Version 4.2	Last checked on 28/03/2022
14.	VCS Program Guide	Version 4.1	Last checked on 28/03/2022
15	Remote site audit for project activity conducted by assessment team	-	14/03/2022

APPENDIX 2: ABBREVIATIONS

Abbreviations	Full texts
ABT	Availability Based Tariff
BEF	Baseline Emission Factor
BM	Build Margin
CAR	Corrective Action Request
CEA	Central Electricity Authority
CERC	Central Electricity Regulatory Commission
CL	Clarification Request
CMS	Central Monitoring System
CMP	Conference of Parties Serving as Meeting of Parties
CO2	Carbon dioxide
DISCOM	Distribution Company (electricity)
EB	Executive Board
EPC	Engineering, Procurement and Construction
FAR	Forward Action Request
GHG	Green House Gas
ISO	International Standards Organization
JMR	Joint Meter Reading
kW	Kilowatt
kWh	Kilowatt hour
MEDA	Maharashtra Energy Development Agency
MFR	Multi-Function Relay
MR	Monitoring Report
MSEDCL	Maharashtra State Electricity Distribution Company Limited
MW	Megawatt
MWh	Megawatt-hour

NEWNE	Northern Eastern Western Northern-Eastern
O&M	Operation and Maintenance
PD	Project Description
PLF	Plant Load Factor
PP	Project Proponent
PPA	Power Purchase Agreement
QA/QC	Quality Assurance and Quality Control
TOD	Time of the Day
UNFCCC	United Nations Framework Convention on Climate Change
WEC	Wind Energy Convertor
WEG	Wind Energy Generator
WTG	Wind Turbine Generator
VCS	Voluntary Carbon Standard
VCSA	Voluntary Carbon Standard Association
VCS PD	VCS Project Description
VCUs	Voluntary Carbon Units

APPENDIX 3: FINDINGS OVERVIEW

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

FAR ID	01	Section no.	Renewal CP Validation report	Date : 04/03/2022
Description of FAR				
FAR#01 for the Validation report: During the validation process physical site visit is not conducted, thus the project implementation status including monitoring plan as described in the updated PD cannot be confirmed, therefore in line with the paragraph 28 of VVS version 09, the verifying VVB shall check/review the project implementation in accordance with the PD during 1st periodic verification after registration. FAR#01 has been satisfactory closed during the 1st verification of the 2nd crediting period by the verifying agency. OK				
Project participant response				Date : DD/MM/YYYY
NA				
Documentation provided by project participant				
NA				
VVB assessment				Date: DD/MM/YYYY
NA				

There are no applicable / Open FARs from previous Monitoring period.

Table 2. CL from this verification

CL ID	01	Section no.	MR	Date : 04/03/2022
Description of CL				
1. The project Proponent has used the latest available template for monitoring report – VCS, version 4.1. However, the section 1.11 - Sustainable Development contributions is not filled as per the template guidelines. i.e. Table 1 is not provided. Please clarify 2. PP needs to follow the defined fonts consistently across the MR and see the relevant sections are appropriately filled and not misplaced. Also to see if latest version of standard is referred. 3. PP may try to avoid unnecessary information regarding temporary deviations taken during the monitoring periods of previous CP, which may not be relevant now as to maintain transparency. Also the unnecessary monitoring plan information, which is revised and approved during CP renewal can be avoided.				
Project participant response				Date : 05/03/2022
1. In revised version of MR, section 1.11 - Sustainable Development contributions is filled as per the template guidelines. 2. In revised version of MR, corrections have been made and fonts are consistent across MR. 3. Information regarding temporary deviations taken during the monitoring periods of previous CP & monitoring plan information, which is revised and approved during CP renewal is kept for better transparency.				
Documentation provided by project participant				
Revised Version of MR				
VVB assessment				Date: 28/03/2022

1. The PP has submitted the revised MR in accordance with the latest available template for monitoring report, version 4.1. Ok. The description related to sustainable development contribution also added. It is noted that VCS standard 1, requires project proponents to demonstrate the contribution to at least 2 sustainable development goals and the PP has demonstrated for only one goal – 13. However, this requirement of the VCS standard is applicable immediately for all projects registered on or after 20 January 2023 and for projects registered before 20 January 2023 needs to demonstrate contributions to at least three SDGs by 20 January 2025. Thus, it is not mandatory for PP to demonstrate contribution to at least 3 SDG goals for current monitoring period. Ok. 2. The template has been made consistent including fonts and latest version of VCS standard is now referred. Ok 3. The has clarified the mentioning of information. OK Closed.

CL ID	02	Section no.		Date : 28/03/2022
Description of CL				
The PP is requested to submit declaration confirming that the GHG Emission reductions or removals generated by the project activity will not be used for compliance with an emission trading program or to meet binding limits on GHG Emissions.				
Project participant response				Date : 06/04/2022
PP has submitted declaration pertaining to confirmation that the GHG Emission reductions or removals generated by the project activity will not be used for compliance with an emission trading program or to meet binding limits on GHG emissions.				
Documentation provided by project participant				
Undertaking				
VVB assessment				Date: 15/04/2022
The PP has provided the declaration for confirming non- participation in any other GHG program or trading mechanism. The project activity is also not registered with any other GHG mechanism and there are no possibilities for double counting of the GHG emission reductions for current monitoring period.				
Closed.				

CL ID	03	Section no.		Date : 28/03/2022
Description of CL				
Please clarify why the information regarding the ongoing communication with local stakeholders is not provided in section 2.2 of the MR, in line with the guidelines provided under the clause 3.17.4 and 3.17.5 of the VCS standard v 04.2.				
Project participant response				Date : 06/04/2022
PP has incorporated information regarding the communication with local stakeholders in section 2.2 of the revised MR, in line with the guidelines provided under the clause 3.17.4 and 3.17.5 of the VCS standard v 04.2.				
Documentation provided by project participant				
Revised MR				
VVB assessment				Date: 15/04/2022

The PP has established a mechanism for on going local stakeholder consultations and details regarding the same are now added in the MR.
This was also discussed and verified during the interview conducted with site in-charge during the remote audit.
Closed.

Table 3. CAR from this verification

CAR ID	01	Section no.	4	Date : 04/03/2022
Description of CAR				
It is observed from MR that there were calibration delays of the energy meters during the previous monitoring period. A permanent deviation had been taken during the previous monitoring period for changing the calibration frequency to 5 years in line with CEA notification. However				
- PP is requested to provide last calibration certificates for Kadvekhurd and Bhambarwadi site. - For rest of the meters MR mentions calibration dates as of 2019, while certificates shared are of 2018. - MR still mentions calibration frequency as annual at some places, which is lacks transparency.				
Project participant response				Date : 05/03/2022
1. Latest calibration certificates for Kadvekhurd and Bhambarwadi site are submitted along with revised version of MR. 2. The calibration dates have been corrected in revised version of MR. 3. In revised version of MR, frequency of calibration is corrected to once in 5 years as per deviation taken in last monitoring period.				
Documentation provided by project participant				
Revised MR, ER Calculation Sheet, Calibration Certificates				
VVB assessment				Date: 28/03/2022
1. Latest calibration certificates for Kadvekhurd and Bhambarwadi sites are provided by the PP and checked. OK 2. The calibration dated were wrongly mentioned in the MR and now corrected by the PP in line with provided certificates. OK 3. The error in MR is now corrected and MR now consistently mentions the calibration frequency as 5 Years. OK				

APPENDIX 4: COMPETENCY STATEMENTS

Competence Statement			
Name	Harsh Raval		
Education	Bachelor of Engineering in Chemical Engineering Masters of Science in Environmental and Energy Engineering		
Experience	15 Years		
Field	Climate Change, Environment and Waste Management		
Approved Roles			
Team Leader	YES		
Validator	YES		
Verifier	YES		
Methodology Expert	YES(AMS-I.D, ACM0002)		
Local expert	YES (INDIA)		
Financial Expert	NO		
Technical Reviewer	YES		
TA Expert (1.2)	YES		
Reviewed by	Deepika Mahala (Quality Manager)	Date	08/12/2021
Approved by	Ashok Gautam (Technical Manager)	Date	08/12/2021

Competence Statement			
Name	Mihika Saxena		
Education	B. Tech Civil Engineering		
Experience	NA		
Field	Environmental 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	Deepika Mahala	Date	09/03/2022
Approved by	Ashok Gautam	Date	09/03/2022

Competence Statement			
Name	Shreya Garg		
Country	India		
Education	M.Sc. (Climate Science & Policy), TERI University		
Experience	6 Years +		
Field	Climate Change		
Approved Roles			
Team Leader	YES		
Validator	YES		
Verifier	YES		
Methodology Expert	AMS.I.A., AMS.I.C., AMS.I.D., AMS.I.F., AMS.II.D., AMS.II.G., AMS.II.J., AMS.III.AV., AMS.III.BL, ACM0002, ACM0012		
Local expert	YES (India)		
Financial Expert	NO		
Technical Reviewer	YES		
TA Expert	YES (TA 1.2, TA 3.1)		
Reviewed by	Shifali Guleria	Date	26/04/2022
Approved by	Deepika Mahala	Date	26/04/2022