JCM Verification Report Form

A. Summary of verification

A.1. General Information

Title of the project	Solar Power on Rooftop of School Building Project
Reference number	MV001
Monitoring period	01/12/2018 – 31/12/2020
Date of completion of the monitoring report	12/01/2022
Third-party entity (TPE)	Lloyd's Register Quality Assurance Limited (LRQA)
Project participant contracting the TPE	Pacific Consultants Co., Ltd.
Date of completion of this report	04/02/2022

A.2 Conclusion of verification and level of assurance

Overall verification opinion	☒ Positive ☐ Negative
☒ Unqualified opinion	Based on the process and procedure conducted, *Lloyd's Register Quality Assurance Limited (LRQA)* (TPE's name) provides reasonable assurance that the emission reductions for *Solar Power on Rooftop of School Building Project* (project name) ✓ Are free of material errors and are a fair representation of the GHG data and information, and ✓ Are prepared in line with the related JCM rules, procedure, guidelines, forms and other relevant documents
(If overall verification opinion is negative, please check below and state its reasons.) ☐ Qualified Opinion ☐ Adverse opinion ☐ Disclaimer	<State the reasons> Not applicable

A.3. Overview of the verification results

Item	Verification requirements	No CAR or CL remaining
The project	The TPE determines the conformity of the actual	☒

Item	Verification requirements	No CAR or CL remaining
implementation with the eligibility criteria of the applied methodology	project and its operation with the eligibility criteria of the applied methodology.	
The project implementation against the registered PDD or any approved revised PDD	The TPE assesses the status of the actual project and its operation with the registered/validated PDD or any approved revised PDD.	☒
Calibration frequency and correction of measured values with related requirements	If monitoring Option C is selected, the TPE determines whether the measuring equipments have been properly calibrated in line with the monitoring plan and whether measured values are properly corrected, where necessary, to calculate emission reductions in line with the PDD and Monitoring Guidelines.	☒
Data and calculation of GHG emission reductions	The TPE assesses the data and calculations of GHG emission reductions achieved by/resulting from the project by the application of the selected approved methodology.	☒
Avoidance of double registration	The TPE determines whether the project is not registered under other international climate mitigation mechanisms.	☒
Post registration changes	The TPE determines whether there are post registration changes from the registered PDD and/or methodology which prevent the use of the applied methodology.	☒

Authorised signatory:	Mr. ☒ Ms. ☐
Last name: Chiba	First name: Michiaki
Title: Climate Change Manager - Asia & Pacific	
Specimen signatu [redacted]	Date: 04/02/2022

B. Verification team and other experts

	Name	Company	Function*	Scheme competence*	Technical competence*	On-site visit
Mr. ☒ Ms. ☐	Michiaki Chiba	LRQA Ltd.	Team leader	☒	Technical competence authorised	☐
Mr. ☒ Ms. ☐	Srikanth Meesa, Ketan Deshmukh	LRQA India	Team member Team member	☒	N/A	☐
Mr. ☒ Ms. ☐	Xianxin Yan Cholid Bafagih	LRQA China LRQA Indonesia	Team member Team member	☒	N/A	☐
Mr. ☒ Ms. ☐	Stewart Niu	LRQA China	Internal reviewer	☒	N/A	☐

Please specify the following for each item.

* *Function: Indicate the role of the personnel in the validation activity such as team leader, team member, technical expert, or internal reviewer.*

* *Scheme competence: Check the boxes if the personnel have sufficient knowledge on the JCM.*

* *Technical competence: Indicate if the personnel have sufficient technical competence related to the project under validation.*

C. Means of verification, findings and conclusions based on reporting requirements

C.1. Compliance of the project implementation and operation with the eligibility criteria of the applied methodology

<Means of verification>

LRQA has determined during the verification process that the actual implementation and operation of the project has been conducted in conformance with the eligibility criteria of the applied methodology.

The project applied the approved methodology: JCM_MV_AM001_ver01.0 Displacement of Grid and Captive Genset Electricity by Solar PV System, Ver 01.0.

LRQA assessed by means of a remote assessment including document review and interviews that the physical features of the project are in place and that the PPs have operated the project as per the eligibility criteria of the applied methodology. The steps taken to verify each eligibility criterion and the conclusions about implementation of the project are summarised as below.

Criterion 1: The project installs solar PV system(s).
Justification in the PDD: A solar PV system is installed. The solar PV module employed is Trinasolar multicrystalline solar module TSM-PD05. The inverter employed is SMA Sunny Tripower 10000TL, 15000TL, and 20000TL.
Steps taken for assessment: The verification team assessed the project documentation, technical specification of the project solar PV system, the contract, the commissioning report and conducted the remote assessment including interviews.
Conclusion: The verification team confirmed that the project installs solar PV system including the solar PV modules and inverters, and the criterion is met by the project.

Criterion 2: The solar PV system is connected to the internal power grid of the project site and/or to the grid for displacing grid electricity and/or captive electricity at the project site.
Justification in the PDD: The solar PV system is connected to the internal power grid of the project site and to the grid for displacing grid electricity.
Steps taken for assessment: The verification team assessed the project documentation, technical specification of the project solar PV system, the electricity diagram, and conducted the remote assessment including interviews.
Conclusion: The verification team confirmed that the solar PV system is connected to the electricity system of the Villa College Ql Campus. The electricity supply system of Villa College Ql Campus is connected to the public power grid system and no captive electricity is used in the project site. The project was confirmed to displace consumption of grid electricity. The criterion is met by the proposed project.

Criterion 3: The PV modules have obtained a certification of design qualifications (IEC 61215, IEC 61646 or IEC 62108), safety qualification (IEC 61730-1 and IEC 61730-2), and have fulfilled the requirements of IEC 61701.
Justification in the PDD: The installed PV module Trinasolar multicrystalline solar module TSM-PD05 has obtained a certification of design qualifications (IEC 61215) and safety qualification (IEC 61730-1 and IEC 61730-2). It has fulfilled the requirements of IEC 61701.
Steps taken for assessment: The verification team reviewed the technical specification of the PV module and the quality certificates.
Conclusion: The verification team confirmed that the PV module employed by the project has been certified with IEC 61215, IEC61730-1, IEC61730-2 and IEC 61701 as appropriate. The criterion is met by the project.

Criterion 4: The equipment to monitor output power of the solar PV system and irradiance is installed at the project site.

Justification in the PDD: An electricity meter is installed to measure the output power of the solar PV system. A pyranometer is installed at the site to measure irradiance.
Steps taken for assessment: The verification team assessed the project documentation, technical specification of the monitoring system, and conducted the remote assessment including interviews.
Conclusion: The verification team confirmed that the equipment to monitor output power of the solar PV system and irradiance have been installed at the project site. The criterion is met by the project.

The verification team confirmed that the eligibility conditions are satisfied by the project by reviewing the supporting documents and conducting the remote assessment including interviews.
The details of the persons interviewed and the documents reviewed are shown in the Section F of this report.

<Findings>

Please state if CARs, CLs, or FARs are raised, and how they are resolved.

No issue was raised to the requirements of the section.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

The verification team confirmed that the project has been implemented in conformity with the eligibility criteria of the applied methodology.

C.2. Assessment of the project implementation against the registered PDD or any approved revised PDD

<Means of verification>

The project installed 186.72 kW grid-connected solar PV system on the roof top of school buildings owned by Villa Educational Services Private Limited, at Rah'debau Hingun, Male, the Republic of Maldives. The power from the solar PV system replaces the grid electricity. The power generated by the solar PV system is firstly self-consumed. When there is surplus power, it is exported to the grid utilizing the net-metering scheme. A remote monitoring system to monitor the performance of the system is also installed.
The project solar PV system applies Trinasolar multicrystalline solar module TSM-PD05. The project has been implemented by Villa Educational Services Private Ltd. from the Republic of Maldives, and Pacific Consultants Co., Ltd. (PCKK) from Japan (the PPs).
The start date of project operation is on 02/09/2017 and the expected operational lifetime of the project is for 10 years.
The project has been selected as one of the JCM model projects by the Ministry of the

Environment, Japan (MOE) and receives financial support from the Government of Japan.
The verification team assessed the Monitoring Report (MR) consists of Monitoring Report Sheet (MRS) parts of the Monitoring Spreadsheet and the supporting documents, conducted a remote assessment including interviews to assess the status of the actual project and its operation in accordance with the registered PDD. No revision to the registered PDD was requested.
The verification team determined through the verification process that the implementation and operation of the project has been in accordance with the description contained in the registered PDD. The verification team, by means of a desk review and a remote assessment including interviews, assessed that:
- all physical features of the JCM project described in the registered PDD are in place, and
- the PPs have operated the JCM project as per the registered PDD.
The MR follows the Monitoring Plan (MP) of the registered PDD that have been established based on the approved methodology. The parameter to be monitored ex-post is EGi,p the total quantity of the electricity generated by the project solar PV system i during the period p (in MWh/p).
The roles and responsibilities of the persons are described in the Monitoring Structure Sheet (MSS) in accordance with the requirements of the applied methodology. There was no change in the organizational structure during the monitoring period.
The details of the persons interviewed and the documents reviewed are shown in the Section F of this report.

<Findings>

Please state if CARs, CLs, or FARs are raised, and how they are resolved.

Grade / Ref: CL 1
Nature of the issue raised: The PPs were required to provide the detailed information of the solar system relocation plan for review and confirmation by the verification team.
Nature of responses provided by the PPs: The PPs provided the relevant documents to explain details of the solar system relocation work for review by the verification team.
Assessment of the responses: The verification team reviewed the documents submitted by the PPs and confirmed that 41.58 kW solar panels (22% of the project) were moved to the roof of other buildings resulted in reduced electricity generation for 10 days in June 2019 about 0.6% of electricity generation in the year but it did not alter operation of the project nor change the registered JCM project.
The CL was closed.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

The verification team confirmed that the project was implemented and operated in accordance

with the registered PDD and no revision to the same was requested for the monitoring period.

C.3. Compliance of calibration frequency and correction of measured values with related requirements

<Means of verification>

The parameter No. (1) EGi,p applies the monitoring Option C and the monitoring of the parameter uses electricity meter as the measuring equipment. The electricity meter is certified to the requirements of IEC 62053-21 and the accuracy class is 1. The meter will be replaced or tested for accuracy within 10 years in accordance with the registered MP. No correction was required to the measured values to calculate emission reductions in line with the PDD and Monitoring Guidelines during the monitoring period.

The details of the persons interviewed and the documents reviewed are shown in the Section F of this report.

<Findings>

Please state if CARs, CLs, or FARs are raised, and how they are resolved.

No issue was raised to the requirements of this section.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

The verification team confirmed that the measuring equipment applied for the parameter satisfied the requirements of the MP concerning the regular calibration and no correction was required to the measured values during the monitoring period.

C.4. Assessment of data and calculation of GHG emission reductions

<Means of verification>

The PPs are responsible for the preparation and fair presentation of the MR in accordance with the requirements of JCM rules and the verifier is responsible for expressing an opinion on the MR based on the verification. The MR is developed using the MRS applied to the registered JCM project that is confirmed fulfilment of the requirements of the MRS of the applied methodology.

LRQA has determined that:

1. a complete set of data for the specified monitoring period is available,
2. information provided in the MR has been cross-checked with other sources such as plant log books, inventories, purchase records, laboratory analysis,
3. calculations of reference emissions (REs) and project emissions (PEs), as appropriate, have been carried out in accordance with the formulae and methods described in the MP and the applied methodology,
4. any assumptions used in emission calculations have been justified, and

5. appropriate emission factors, default values and other reference values have been correctly applied.

The project introduces solar PV system at the school and emission source is consumption of grid electricity in the reference scenario. PEs is not applicable for generation of electricity from solar PV system in accordance with the applied methodology.

The REs are determined as a product of total electricity generation and the default reference CO2 emission factor of the applied methodology at 0.533 tCO2/MWh.

The GHG emission reductions during the monitoring period (each for year 2018, 2019 and 2020) are calculated as: ERp = REp - PEp = REs = Σ EG_i,p x EF_RE

From 01/12/2018 to 31/12/2018

18.86 x 0.533 tCO2/MWh = 10.1 tCO2e.

From 01/01/2019 to 31/12/2019

238.71 x 0.533 tCO2/MWh = 127.2 tCO2e.

From 01/01/2020 to 31/12/2020 (366 days)

227.47 x 0.533 tCO2/MWh = 121.2 tCO2e.

Achieved electricity generation in second monitoring period of 25 months (762 days) is 485.04 MWh in total, that is 232.34 MWh (485.04 MWh x 365/762) in a year and 21% lower level than ex-ante estimate in PDD of 293.05 MWh. The reading of electricity meter for December 2020 was recorded on 03/01/2021 and the PPs decided not to include the data of electricity generation from 02/12/2020 to 31/01/2021 for calculation of the emission reductions since accurate data is not available to determine GHG emission reductions until the end of the monitoring period on 31/12/2020 and it is conservative.

The verification team assessed the reported data with documented evidence and by means of document review and the remote assessment including interviews.

The details of the persons interviewed and the documents reviewed are shown in the Section F of this report.

Parameters	Monitored values	Method to check values in the monitoring report with sources
EGi,p (2018)	18.86 MWh/p	Assessment was conducted based on records of monthly meter readings and interviews.
EGi,p (2019)	238.71 MWh/p	Assessment was conducted based on records of monthly meter readings and interviews.
EGi,p (2020)	227.47 MWh/p	Assessment was conducted based on records of monthly meter readings and interviews.

<Findings>

Please state if CARs, CLs, or FARs are raised, and how they are resolved.

Grade / Ref: CL 2

Nature of the issue raised: The PPs were required to provide electricity generation data and electricity bills for review and confirmation by the verification team the impacts of facility lock down during the COVID-19 pandemic period.

Nature of responses provided by the PPs: The PPs provided the generation data of the PV system and the bills of the electric company for years 2020 and 2021.

Assessment of the responses: The verification team reviewed the data and information provided by the PPs and crosschecked with the data reported in the MR. Although the facility lock down took place from March to July 2020, electricity generation by the project solar PV system could be maintained through the connection to the public grid system with the net metering scheme. The CL was closed.

Grade / Ref: CL 3

Nature of the issue raised: The PPs were required to clarify how a revision of the reference CO2 emission factor of grid electricity mentioned in the column (e) Source of data of the Table 2 in the Monitoring Report Sheet is applied.

Nature of responses provided by the PPs: The PPs provided estimation of the grid electricity emission factor in the capital Male following the methods of the approved methodology applying the updated generation data in year 2019, resulted in 0.672 tCO2/MWh. The default emission factor of the JCM methodology 0.533 tCO2/MWh is conservative and revision of the emission factor is not required.

Assessment of the responses: The verification team reviewed the estimation provided by the PPs and the supporting information of the power sector in the host country. It also reviewed the similar application with the JCM methodologies, the proposed and registered projects in the other host countries and agreed that the parameter of electricity emission factor fixed ex-ante for the project at the validation does not need to be revised.

The CL was closed.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

The verification team confirmed that appropriate methods and formulae for calculating REs and PEs have been followed. The verification team is of the opinion that all assumptions, emissions factors and default values that were applied in calculations have been justified.

C.5. Assessment of avoidance of double registration

<Means of verification>

The verification team assessed and confirmed relevance of the written confirmation from the PPs that the project is not registered under the other international climate mitigation mechanisms.
The team in addition to the interviews with the PPs checked publicly accessible information of Clean Development Mechanism (CDM), Joint Implementation (JI), Verified Carbon Standard (VCS) and Gold Standard (GS) and found no identical project as the proposed JCM project in terms of the name of entities, applied technology, scale and the location. The result of researches confirmed that the proposed project was not registered under the other international climate mitigation mechanisms than JCM and it will not result in a double counting of GHG emission reductions.
CAR 1 was issued that the details of resolution are as described below.
The details of the persons interviewed and the documents reviewed are shown in the Section F of this report.

<Findings>

Please state if CARs, CLs, or FARs are raised, and how they are resolved.

Grade / Ref: CAR 1
Nature of the issue raised: The declaration letter on avoidance of double registration had not yet been officially issued and submitted to the verification team.
Nature of responses provided by the PPs: The PPs submitted the signed letter of declaration.
Assessment of the responses: The verification team received and reviewed the declaration letter signed by the PP that confirmed the project was not registered with the other international climate mitigation mechanisms.
The CAR was closed.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

The verification team confirmed that the projects not registered under other international climate mitigation programs.

C.6. Post registration changes

<Means of verification>

The verification team assessed the project documentation and through the document review and interviews and confirmed that there was no post registration change from the registered PDD or the approved methodology.

<Findings>

Please state if CARs, CLs, or FARs are raised, and how they are resolved.

Please refer to the above section C.2. The finding has been closed.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements. The verification through the verification processes determined that there was no post registration change from the registered PDD or approved methodology which prevent from use of the applied methodology.

D. Assessment of response to remaining issues

An assessment of response to the remaining issues including FARs from the validation and/or previous verification period, if appropriate

No FAR was issued in the previous verification of the project.

E. Verified amount of emission reductions achieved

Year	Verified Reference Emissions (tCO_2e)	Verified Project Emissions (tCO_2e)	Verified Emission Reductions (tCO_2e)
2013			
2014			
2015			
2016			
2017			
2018	10.1	0	10
2019	127.2	0	127
2020	121.2	0	121
2021			
2022			
2023			
2024			
2025			
2026			
2027			
2028			
2029			
2030			
Total (tCO_2e)			258

F. List of interviewees and documents received

F.1. List of interviewees

Villa College / Villa Educational Services Private Ltd.

Abdul Munnim Mohamed Manik, Deputy Vice Rector, Administration and Finance (Project Manager)
Abdulla Naseer, Manager, Physical Facilities Unit
Ibrahim Waheed, Manager, Physical Facilities Unit
Abdulla Hakeem, Manager, Physical Facilities Unit

Pacific Consultants Co., Ltd. Shigezane Kidoura, Chief Engineering Consultant, Project Management and Engineering Department, Global Company

F.2. List of documents received

Category A documents (documents prepared by the PP) - Monitoring report dated 22/09/2021 and 12/01/2022 - Data sheet for calculating emission reductions - Electricity meter reading logbook - EC Type Examination Certificate for EDMI Mk10A dated 23/04/2015 (JCM project monitoring point) - Profile of Villa College - Technical specification of the Honey Framed 60-cell Module specification, Trina Solar Limited - Project Completion Report for Supply and Installation of 186.72 kW Solar PV System at Villa College QI Campus, Male' Maldives, Avi Technologies Pvt Ltd. - Single Line Diagram Roof A, B, C, D, E1, E2, F, G1, G2, H, I1, I2, Grid Connection, Existing LV Main Distribution Panel - Certificate of IEC 61215:2005, TUV Rheinland LGA Products GmbH dated 02/12/2013 - Certificate of IEC 61730-1:2004 and IEC 61730-2:2004, TUV Rheinland LGA Products GmbH dated 02/12/2013 - Certificate for IEC61701:2011 - Silicon-cell Pyranometers specification, Apogee Instruments - Certificate of Type Test of Energy Meters for EDMI Mk6N, KEMA T&D Testing Services dated 02/10/2010 (Net meter) - Mk6N Advanced Three Phase Electronic Revenue Meter Specifications, EDMI Limited (Net meter) - Monitoring Manual Ver. 3.1, Pacific Consultants Co., Ltd. - Declaration letter on no double registration dated 22/11/2021 - Villa College PV System Relocation – QI Campus Module Allocation Drawing - Villa College PV System Relocation – QI Campus Roof H Module Allocation Drawing - Villa College PV System Relocation – QI Campus Roof I Module Allocation Drawing - Villa College QI Campus Revised Single Line Diagram

- Electricity bills 2020, 2021
- Electricity generation from PV (2020-2021)
- Island Electricity Data Book 2019, Maldives Energy Authority
- Grid emission factor assessment for Maldives

Category B documents (other documents referenced)
- Registered PDD Version 01.0 dated 26/02/2018 and the Monitoring spreadsheet
- Validation report for the project dated 13/06/2018
- Verification report for the previous monitoring period of the project
- Revised MoC Form Annex 1 dated 05/02/2019 and 20/10/2021
- JCM_MV_AM001_ver01.0 Displacement of Grid and Captive Genset Electricity by Solar PV System, Ver 01.0
- Additional Information to the Proposed Methodology Displacement of Grid and Captive Genset Electricity by Solar PV System
- JCM Project Cycle Procedure JCM_MV_PCP_ver02.0 and JCM_MV_PCP_ver03.0
- JCM Guidelines for Validation and Verification JCM_MV_GL_VV_ver01.0
- JCM Guidelines for Developing PDD and MR JCM_MV_GL_PDD_MR_ver02.0
- JCM Glossary of Terms JCM_MV_Glossary_ver01.0
- JCM Verification Report Form JCM_MV_F_Vrf_Rep_ver02.0
- Approved Small Scale CDM Methodology AMS I.D. Version 18.0 Grid connected renewable electricity generation
- Approved CDM Methodological Tool to calculate the Emission Factor for an electricity system
- Proposed and registered projects under CDM, VCS, Gold Standard, and the other international schemes
- IEC 62053-21, Electricity metering equipment (a,c,) - Particular requirements - Part 21: Static meters for active energy (classes 1 and 2)
- Metering Code, Energy Market Authority of Singapore, January 2014
- Metering Scheme Regulation, Maldives Energy Authority
- COVID-19 Tracker – Maldives
- Temperature data of Male 2017-2021
- ISO 14064-2:2019 - Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements
- ISO 14064-3:2019 – Specification with guidance for the verification and validation of greenhouse gas statements

Annex Certificates or curricula vitae of TPE's verification team members, technical experts and internal technical reviewers

Please attach certificates or curricula vitae of TPE's validation team members, technical experts and internal technical reviewers.

Certificate of Appointment is attached to this report.

Joint Crediting Mechanism Certificate of Appointment

Title of Project: Solar Power on Rooftop of School Building Project (Ref# MV001)
Verification for the second monitoring period: 01/12/2018 – 31/12/2020

We hereby certify that the following personnel have engaged in the verification process that has fully satisfied the competence requirements of the verification of the JCM project.

Name of Person	Assigned Roles
Michiaki Chiba	Team Leader
Srikanth Meesa	Team Member
Ketan S. Deshmukh	Team Member
Xianxin Yan	Team Member
Cholid Bafagih	Team Member
Stewart Niu	Technical Reviewer

Signed by

Michiaki Chiba
Climate Change Manager – Asia & Pacific
22/09/2021