JCM Verification Report Form

A. Summary of verification

A.1. General Information

Title of the project	Introduction of Ultra-lightweight Solar Panels for Power Generation at International School
Reference number	KH001
Monitoring period	01/08/2016 - 31/07/2018
Date of completion of the monitoring report	31/10/2018
Third-party entity (TPE)	Lloyd's Register Quality Assurance Limited (LRQA)
Project participant contracting the TPE	Asian Gateway Corp.
Date of completion of this report	02/11/2018

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 *Introduction of Ultra-lightweight Solar Panels for Power Generation at International School* (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 implementation with the eligibility criteria of the applied methodology	The TPE determines the conformity of the actual 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 signature: [redacted]	Date: 02/11/2018

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. ☐	Stewart Niu	LRQA China	Internal reviewer	☒	N/A	☐
Mr. ☐ Ms. ☐				☐		☐
Mr. ☐ Ms. ☐				☐		☐

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 through 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_KH_AM002_ver01.0 "Installation of solar PV system, Ver 01.0".

LRQA assessed by means of an on-site visit 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: The project installs 200 kW green-field solar power system on the roof of the international school in Phnom Penh.

Steps taken for assessment: The verification team assessed the project documentation, technical specification of the project solar power system, the contract, the commissioning report and

conducted physical on site assessment.
Conclusion: The verification team confirmed that the project installs solar power system including the solar PV modules and inverters, and the criterion is met by the project.

Criterion 2: The PV modules have obtained a certification of design qualifications (IEC 61215, IEC 61646 or IEC 62108) and safety qualification (IEC 61730-1 and IEC 61730-2).
Justification in the PDD: The PV modules installed in the project have been certified for IEC 61215, IEC 61730-1 and IEC 61730-2.
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 and IEC61730-2 as appropriate. The criterion is met by the project.

Criterion 3: The equipment to monitor output power of the solar PV system(s) and irradiance is installed at the project site.
Justification in the PDD: Electricity meter and pyranometer have been installed at the international school to monitor output power and irradiance respectively.
Steps taken for assessment: The verification team assessed the project documentation, technical specification of the monitoring system, and conducted physical on site assessment.
Conclusion: The verification team confirmed that the equipment to monitor output power of the solar PV system and irradiance has 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 the on site assessment.
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 total 200 kW grid connected solar power generation systems on the rooftop of the school buildings at the International School of Phnom Penh (ISPP), the Kingdom of Cambodia. The electricity generated by the solar power generation systems is self-consumed in the school facility and replaces electricity import from the public electricity grid.

The project solar power generation systems apply Asahi Glass Co.'s ultra-lightweight solar panels Lightjoule. The project has been implemented by ISPP from Kingdom of Cambodia and Asian Gateway Corp. from Japan (the PPs).

The start date of project operation is on 01/08/2016 and the expected operational lifetime of the project is for 17 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 registered Monitoring Spreadsheet and the supporting documents, conducted a physical site visit 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 an on-site visit, 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 in the project 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.

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 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 meters as the measuring equipment. The meters have been type approved in compliance with the standard IEC 62053-22 with accuracy class 0.5s as described in 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 the 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 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 rooftop solar power generation systems at the school buildings and emission source is consumption of grid electricity in the reference scenario. PEs is not applicable for generation of electricity from solar PV systems 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 0.353 tCO2/MWh.

The GHG emission reductions during the monitoring period (each for year 2016, 2017 and 2018) are calculated as: ERp = REp - PEp = REs = Σ (EG_i,p x EF_RE,i)

From 01/08/2016 to 31/12/2016

111.46 x 0.353 tCO2/MWh = 39 tCO2e.

From 01/01/2017 to 31/12/2017

281.71 x 0.353 tCO2/MWh = 99 tCO2e.

From 01/01/2018 to 31/07/2018

124.28 x 0.353 tCO2/MWh = 43 tCO2e.

Achieved electricity generation in the first monitoring period of 24 months (730 days) is 517.45 MWh in total, that is 258.73 MWh (517.45 MWh x 365/730) in a year and 12% lower level than ex-ante estimate in the PDD of 296.56 MWh.

The verification team assessed the reported data with documented evidence and by means of on site visit.

Through the processes taken, CAR 1 was raised as the resolution detailed below.

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 (2016)	111.46 MWh/p	Assessement was conducted based on records of monthly meter readings and on site assessment.
EGi,p (2017)	281.71 MWh/p	Assessement was conducted based on records of monthly meter readings and on site assessment.
EGi,p (2018)	124.28 MWh/p	Assessement was conducted based on records of monthly meter readings and on site assessment.

<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 records of monthly electricity meter readings were missed for some months and the total electricity generation during the monitoring period was not substantiated.

Nature of responses provided by the PPs: The PPs revised the monitoring manual to improve

instructions for the monitoring activities and prevent loss of the records from occurring in the future monitoring periods and provided supporting data for the monitored values. The ERs achieved in year 2018 were corrected from 44 tCO2 to 43 tCO2.

Assessment of the responses: The verification team reviewed the revised monitoring manual, supporting data for the monitored values, the revised MR and confirmed correction of monitored data and the calculation of the ERs as relevant. The CAR 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 2 was raised as the resolution detailed 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 2

Nature of the issue raised: The PPs were requested to submit a written confirmation on that the project is not registered under other international climate mitigation mechanisms.

Nature of responses provided by the PPs: The PPs submitted a written confirmation for review by the verification team.

Assessment of the responses: The verification team reviewed and the written confirmation submitted by the PPs and confirmed the PPs demonstrated avoidance of double registration of the project through the monitoring period. The CAR was closed.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

The verification team confirmed that the project is 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 on site visit 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.

No issue was raised to the requirements of this section.

<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 validation and this is the first 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	39	0	39
2017	99	0	99
2018	43	0	43
2019			
2020			
2021			
2022			
2023			
2024			
2025			
2026			
2027			
2028			
2029			
2030			
Total (tCO_2e)			181

F. List of interviewees and documents received

F.1. List of interviewees

International School of Phnom Penh (ISPP)

Michael Hodgson, Operations Administrator

Sam Ol Kong, Building/Ground Manager

Vichet Kem, MEP Engineer, Maintenance

Asian Gateway Corporation

Yuma Nagata, Director, International Consulting Department

Ly Bunheng, Application Engineer, Energy Division

Meach Makara, Sales Manager, Project Development

Environmental Resource Management (ERM) Japan Ltd.
Tsuyoshi Nakao, Group Leader, Sustainability Management Team

F.2. List of documents received

Category A documents (documents prepared by the PP)

- Monitoring Report dated 10/08/2018
- Revised Monitoring Report dated 17/09/2018
- Revised Monitoring Report dated 31/10/2018
- Monthly electricity generation records
- Corrected monthly electricity generation records
- Daily electricity meters readings records
- Corrected daily electricity meters readings records
- Copy of log books
- Electricity generation data of Smart Logger
- EPC contract agreement
- Specification of photovoltaic module, Light Joure, Asashi Glass Co., Ltd.
- Specification of String Inverter SUN2000-33KTL, Huawei
- Technical specification of DIRIS A20 Multifunction meters - PMD, Socomec S.A.
- Technical specification of Silicon-cell Pyranometer, Kipp & Zonen BV
- User manual
- Photographs of project construction
- Commissioning Report, Sharp Solar Solution Asia Co., Ltd.
- Asahi Glass Limited Warranty Certificate
- Huawei String Inverter Warranty and Service Condition
- Single Line Diagram
- Certificate by TUV Rheinland No. PV 50285520 to IEC 61215:2005 dated 23/06/2014
- Certificate by TUV Rheinland No. PV 50285522 to IEC 61730-1:2004 and IEC 61730-2:2004 dated 23/06/2014
- Attestation of Conformity No. AC 1039 PRO, Socomec S.A. dated 04/07/2011 for DIRIS A20 following specifications IEC 62053 class 0.5s active energy
- Regulations on general conditions for connecting solar generation sources to the electricity supply system of national grid or to electrical system of a consumer connected to the electricity supply system of national grid, dated 26/01/2018, Electricity Authority of Cambodia
- Monitoring Manual Version 1 dated 22/08/2018

- Written confirmation on avoidance of double registration from the PPs

Category B documents (other documents referenced)

- Registered PDD Version 02.0 dated 15/12/2017
- Registered Monitoring Spreadsheet KH001
- JCM_KH_AM002_ver01.0 Installation of Solar PV System, Ver 01.0
- JCM Project Cycle Procedure JCM_KH_PCP_ver03.0
- JCM Guidelines for Validation and Verification JCM_KH_GL_VV_ver01.0
- JCM Guidelines for Developing PDD and MR JCM_KH_GL_PDD_MR_ver03.0
- JCM Glossary of Terms JCM_KH_Glossary_ver02.0
- JCM Verification Report Form JCM_KH_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 62053-22:2003, Electricity metering equipment (ac) - Particular requirements. Part 22: Static meters for active energy (classes 0,2 S and 0,5 S)

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.

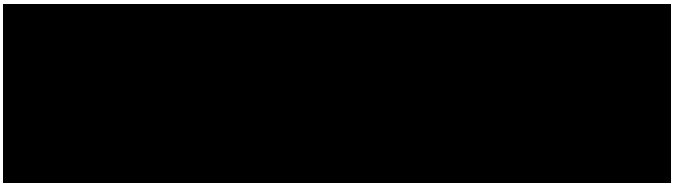
Joint Crediting Mechanism Certificate of Appointment

Title of Project: Introduction of Ultra-lightweight Solar Panels for Power Generation at International School (Project #KH001)
Verification for the first monitoring period: 01/08/2016 – 31/07/2018

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
Stewart Niu	Technical Reviewer

Signed by



Michiaki Chiba
Climate Change Manager – Asia & Pacific
18/07/2018