JCM Verification Report Form

A. Summary of verification

A.1. General Information

Title of the project	10 MW Solar Power Project in Darkhan City
Reference number	MN004
Monitoring period	01/08/2017 - 31/12/2020
Date of completion of the monitoring report	02/02/2022
Third-party entity (TPE)	Lloyd's Register Quality Assurance Limited (LRQA)
Project participant contracting the TPE	Sharp Energy Solutions Corporation
Date of completion of this report	14/02/2022

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 *10 MW Solar Power Project in Darkhan City* (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 TPE determines the conformity of the actual project and its operation with the eligibility criteria of	☒

Item	Verification requirements	No CAR or CL remaining
the eligibility criteria of the applied methodology	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: 14/02/2022

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. ☐	Stewart Niu	LRQA China	Team member	☒	N/A	☐
Mr. ☒ Ms. ☐	Cholid Bafagih	LRQA Indonesia	Team member	☒	N/A	☐
Mr. ☒ Ms. ☐	Xianxin Yan	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_MN_AM003_ver02.0 "Installation of Solar PV System, Ver. 02.0".

LRQA assessed by means of a remote assessment including 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 newly installs solar PV system(s).

Justification in the PDD: The project installs 10MW green-field solar power plant in Darkhan City.

Steps taken for assessment: The verification team assessed the project documentation, technical

specification and production line test report of the project solar PV system, the power purchase agreement (PPA), and conducted a remote assessment including interviews.
Conclusion: The verification team confirmed that the project installs a new solar PV system and the criterion is met by the project. The project 10 MW solar power plant was constructed during July to December 2016 and started the commercial operation from 01/01/2017.

Criterion 2: The PV modules 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 Sharp's PV module model ND-AF310 employed by the project has been certified with IEC 61215, IEC 61730-1 and IEC 61730-2 as appropriate. The criterion is met by the project.

Criterion 3: The equipment used 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 project site 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 remote assessment including interviews.
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 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 10 MW grid connected solar PV system in Darkhan-Uul Province, Darkhan City, Mongolia. The electricity generated by the solar PV system is supplied to the Central Energy System of Mongolia (CES). The project solar PV system applies Sharp's crystalline silicon PV modules model ND-AF310. The project has been implemented by Solar Power International LLC from Mongolia and Sharp Corporation from Japan (the PPs).

The start date of project operation is on 01/01/2017 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 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 Quantity of the electricity generated by the project solar PV system i during the period p (in MWh/p). The electricity meters measure the output power from the solar PV system consisting of 32,274 x 310 W PV panels in 8 blocks and each block has 2 x 630 kW power conditioners and 1,600 kVA transformer, and a 11 MVA main power transformer.

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 verification team checked the status of implementation of the environmental management plan (EMP) and confirmed the PPs have followed the EMP and measures for environmental improvement were implemented including tree planting in response to request of the local stakeholders. A report of EMP implementation will be prepared for approval by the local

authority after one year operation of the project plant.
Through the processes taken, CAR 1 and CL 1 were raised as the resolution detailed below. FAR 1 was also issued for confirmation in the next periodic verification.
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 PPs were required to report the quantity of electricity generated by the project solar PV system during the monitoring period monitored in line with the monitoring plan of the registered PDD. The reported data included data of back-up meters adopted when correct data of the main meter was not obtained due to communication errors of the data collection system, but the data was not substantiated with the procedures established to implement the monitoring plan.
Nature of responses provided by the PPs: The PPs submitted the revised MR with supporting evidence for review by the verification team.
Assessment of the responses: The verification team verified the revised MR with the supporting evidence. The data reported was confirmed based on the reading of the main meter in accordance with the MP of the registered PDD.
The CAR was closed.

Grade / Ref: CL 1
Nature of the issue raised: The PPs were required to review the monitoring procedure manual to clarify use of data from the backup meters, keeping the manual records, and ensure implementation of consistent processes over the period.
Nature of responses provided by the PPs: The PPs demonstrated use of the manual records and revised the MR based on data of the main meter for the monitoring period.
Assessment of the responses: The verification team confirmed that the manual records of the main meter support data applied in the revised MR. FAR 1 was issued to request actions for the subsequent monitoring period.

Grade / Ref: FAR 1
Nature of the issue raised: The PPs were required to further review the monitoring procedure manual to ensure implementation of consistent reporting of the monitored data over the period including implementation of cross checking of data measured by the electricity meters.
Nature of responses provided by the PPs: Not applicable
Assessment of the responses: Not applicable

<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 parameters use electricity meters as the measuring equipment. The main electricity meter installed at the substation of the project solar power plant was calibrated by Mongolian Agency for Standardization and Metrology on 27/02/2014. The meter will be recalibrated every 8 years in accordance with the requirement of the PPA and the current calibration is valid until 27/02/2022. 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 electricity generated by the project solar power plant is sold to the electricity grid company and the trade meter having the accuracy level of 0.2s is installed in Darkhan Substation of the grid company locating next to the project solar power plant. The electricity meter installed in the project solar power plant is of the same model and accuracy level as the trade meter to check the amount of electricity supplied and received at the both ends as required in the PPA. The electricity meter installed at the power plant and an electricity multi meter are both connected to SCADA system and checked to identify any abnormal data. A comparison is also conducted monthly with data of the trade meter in Darkhan Substation. All the meters are applied with the standard MNS IEC 62053-22.

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 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 quantity of electricity generated by the solar PV system and the default reference CO2 emission factor of the applied methodology at 0.797 tCO2/MWh. The project system is not connected to a captive power generator.

The GHG emission reductions during the monitoring period are calculated as: ERp = REp - PEp = REp = Σ _i EG_i,p x EF_RE,i

From 01/08/2017 to 31/12/2017

6,081.504 MWh x 0.797 tCO2/MWh = 4,846.96 tCO2e.

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

16,847.116 MWh x 0.797 tCO2/MWh = 13,427.15 tCO2e.

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

17,382.596 MWh x 0.797 tCO2/MWh = 13,853.93 tCO2e.

From 01/01/2020 to 31/12/2020

15,924.084 MWh x 0.797 tCO2/MWh = 12,691.49 tCO2e.

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

Achieved electricity generation in the second monitoring period of 41 months (1,248 days) is 56,235 MWh in total, that is 16,446 MWh (56,235 MWh x 365/1,248) in a whole year and 17% higher level than ex-ante estimate in PDD of 14,079 MWh. The ex-ante estimation was based on data provided by Meteonorm and 10-20 year historical average irradiation, but the database

did not provide data in Darkhan and the accuracy of estimation was limited. The variation is due to limitation of data for ex-ante estimation and it is also uncertain in outcomes of the other years during the project lifetime. Therefore the verification team concluded no amendment to the estimated ERs in the PDD is necessary to be requested.
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 (2017)	6,082 MWh/p	Assessement was conducted based on records of monthly meter readings and a remote assessment including interviews.
EGi,p (2018)	16,847 MWh/p	Assessement was conducted based on records of monthly meter readings and a remote assessment including interviews.
EGi,p (2019)	17,383 MWh/p	Assessement was conducted based on records of monthly meter readings and a remote assessment including interviews.
EGi,p (2020)	15,924 MWh/p	Assessement was conducted based on records of monthly meter readings and a remote assessment including interviews.

<Findings>

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

Please refer to the findings CAR1, CL 1 and the resolutions in the above Section C.2.

<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, emission 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.

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

C.6. Post registration changes

<Means of verification>

The verification team assessed the project documentation and through the document reviews and a remote assessment including interviews and confirmed that there was no post registration change from the registered PDD or the approved methodology. The PPs presented a revised PDD Version 04.0 dated 27/09/2021 that was reflected the change of company name for the focal point entity from Sharp Corporation to Sharp Energy Solutions Corporation but the verification team confirmed the change does not alter the project described in the registered PDD and prevent use of the applied methodology. The verification team also confirmed that the revised MoC dated 25/11/2021 reflected the change has been submitted to the JC and made publicly available on the JCM website.

<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 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	4,846	0	4,846
2018	13,427	0	13,427
2019	13,853	0	13,853
2020	12,691	0	12,691
2021			
2022			
2023			
2024			
2025			
2026			
2027			
2028			
2029			
2030			
Total (tCO_2e)			44,817

F. List of interviewees and documents received

F.1. List of interviewees

Solar Power International LLC

・Mandalbayar Baldan / General Director

・Galkhuu Ideshtogtokh / Chief engineer

・Ganbat Purevjav/ Interpreter

Sharp Energy Solutions Corporation

・Shoko Fukahori, Supervisor, Overseas Business Development Division I, Sales and Business Development Unit

・Takashi Higuchi, Supervisor, Plant Engineering Division, Project Unit

・Miyu Matsumoto, Supervisor, Overseas Business Development Division II, Sales and Business Development Unit

Pacific Consultants Co., Ltd.
Shigezane Kidoura / Chief Engineering Consultant

F.2. List of documents received

Category A documents (documents prepared by the PPs)
- Monitoring report dated 12/11/2021 and 02/02/2022
- Monthly records of electricity generation
- Monthly electricity production reports
- Revised PDD Version 04.0 dated 27/09/2021
- Technical specification of project solar PV system
- List of solar PV modules and photographs
- Layout of solar power plant
- Quality certificates for the solar PV modules
- Technical specification of power conditioner
- Technical specification of electricity meters
- Calibration certificates of electricity meters, Mongolian Agency for Standardization and Metrology
- Test report of multi-functional power meter
- Technical specification of pyranometer
- Permission of electricity grid connection and power sale
- Single line diagram
- SCADA system diagram
- Power sales agreement
- Training materials
- Records of internal data checks
- Operation and maintenance records
- Declaration letters on no double registration
- Mongolian Government Resolution No. 374, the Law on Environmental Impact Assessment
- Environmental Management Plan
- Monitoring procedures
- Monthly report preparation procedures

Category B documents (other documents referenced)

- Registered PDD Version 03.0 dated 13/03/2017 and the Monitoring spreadsheet
- Revised MoC dated 25/11/2021
- Validation report for the project dated 29/03/2017
- Verification report for the previous monitoring period
- JCM_MN_AM003_ver02.0 Installation of Solar PV System, Ver.02.0
- JCM Project Cycle Procedure JCM_MN_PCP_ver04.0
- JCM Guidelines for Validation and Verification JCM_MN_GL_VV_ver01.0
- JCM Guidelines for Developing PDD and MR JCM_MN_GL_PDD_MR_ver03.0
- JCM Glossary of Terms JCM_MN_Glossary_ver01.0
- 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)
- 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: 10MW Solar Power Project in Darkhan City (Ref# MN004)
Verification for the second monitoring period: 01/08/2017 – 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
Stewart Niu	Team Member
Cholid Bafagih	Team Member
Xianxin Yan	Technical Reviewer

Signed by

Michiaki Chiba
Climate Change Manager – Asia & Pacific
17/11/2021