JCM Verification Report Form

A. Summary of verification

A.1. General Information

Title of the project	Introduction of amorphous high efficiency transformers in power distribution systems in the southern part of Viet Nam
Reference number	VN004
Monitoring period	01/01/2016 – 31/03/2016
Date of completion of the monitoring report	06/03/2017
Third-party entity (TPE)	Lloyd's Register Quality Assurance Limited (LRQA)
Project participant contracting the TPE	YUKO-KEISO Co., Ltd.
Date of completion of this report	08/03/2017

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 amorphous high efficiency transformers in power distribution systems in the southern part of Viet Nam* (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>

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 signa [redacted]	Date: 08/03/2017

B. Verification team and other experts

	Name	Company	Function*	Scheme competence*	Technical competence*	On-site visit
Mr. ☒ Ms. ☐	Michiaki Chiba	LRQA Ltd.	Verification team leader	☒	Technical competence authorised	☒
Mr. ☒ Ms. ☐	Nguyen Thang	External expert	Host country expert	☐	N/A	☒
Mr. ☐ Ms. ☐				☐		☐
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_VN_AM005_ver01.0 "Installation of energy efficiency transformers in a power distribution grid".

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: Single-phase and/or three-phase oil-immersed transformer with amorphous metal core is installed in the distribution grid.

Justification in the PDD: Distribution transformers installed by the project are either single-phase or three phase oil-immersed transformer with amorphous metal core.

Steps taken for assessment: The verification team assessed the project documentation, technical specification of the transformers, the installation reports and conducted physical on site assessment.
Conclusion: The verification team confirmed that the project installs single-phase and three phase oil-immersed transformers with amorphous metal core in the distribution grid of EVN-SPC and the criterion is met by the project.

Criterion 2: Load losses of the project transformer determined in line with IEC 60076-1 or national/industrial standards complying with IEC 60076-1 is equal or smaller than the standard values or specification values of load loss, required by the power company of the grid where the project transformer is installed, corresponding to its capacity and number of phases.
Justification in the PDD: It has been confirmed that the load loss of the project transformers are smaller than the standard/specification values of load loss, required by the power company of the grid where the project transformer is installed, corresponding to its capacity and number of phases. Load losses of the project transformer are determined in line with EVN SPC standard MBA-03_MBA 3P22/0,4kV(Code : EVN SPC-KTSX/QyĐ.114) and MBA-01_MBA 1P12,7/0,23kV(Code: EVN SPC-KTSX/QyĐ.114）
Steps taken for assessment: The verification team reviewed EVN-SPC standards MBA-01 and MBA-03, the tender specification, test reports.
Conclusion: The verification team confirmed that the load loss of the project transformers is smaller than the values specified in the standard requirements of the power company and the criterion is met by the project.

The verification team confirmed that the eligibility conditions are satisfied by the project by reviewing records of activities and interviewing the PPs through 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 1,618 high efficient amorphous transformers displacing conventional and more energy intensive transformers with silicon steel core in power distribution grid operated and maintained by EVN Southern Power Corporation (EVNSPC) in 18 Provinces and 1 province-level City in southern part of Viet Nam. The project transformers apply amorphous alloy core technology developed by Hitachi Metals Ltd., Japan and supplied by the manufacturer Thibidi in Viet Nam. Amorphous transformer improves electrical characteristics and leads significant reduction of no load losses, i.e. stand-by electricity consumed regardless of the electricity load. The project has been implemented by EVNSPC from the Socialist Republic of Viet Nam, and YUKO-KEISO Co., Ltd. from Japan (the PPs).

The start date of project operation is on 01/01/2016 and the expected operational lifetime of the project is for 18 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 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 Hi,p Energizing time of the project transformer i during the period p. The number of hours in the monitoring period is counted based on the date of completion of transformers implementation and adjusted based on the repair/replacement record as necessary.

The PPs ensure counting of hours does not start before implementation and starting operation of all the transformers under the project are completed, that is confirmed by the implementation completion reports. Any repair/replacement of project transformers is reported to and the records are kept at EVNSPC.

The roles and responsibilities of the persons are described in the MSS in accordance with the requirements of the applied methodology. There was no change in the organizational structure during the monitoring period.

Through the processes taken, CAR 2 and FAR 1 were 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 information of project transformers relocated was found inaccuracy and incompleteness. The PPs were requested to re-submit the information of the relocated and replaced transformers with supporting evidence after corrected and checked.

The PPs were also requested to clarify the monitoring and reporting procedures applied including QA/QC procedures and to demonstrate how the PPs ensure completeness and accuracy of data and information to be reflected to determination of energizing time of the project transformers during the monitoring period.

Nature of responses provided by the PPs: The PPs submitted information of the relocated and replaced transformers corrected and internally checked for review by the verification team.

Assessment of the responses: The verification team reviewed the information of the relocated and replaced transformers re-submitted by the PPs after corrections and internal checks. The PPs demonstrated implementation of the QA/QC procedures and no material error was identified that affect the request for issuance of the ERs achieved during the monitoring period.

The CAR was closed while FAR 1 was issued as below.

Grade / Ref: FAR 1

The PPs were requested to improve the procedures for collecting information of the relocated and replaced transformers to be reflected to the counting of the energizing time including the internal data checks to ensure accuracy and completeness and record keeping for the next monitoring period.

<**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. Actions to FAR 1 will be confirmed in the next verification.

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

<**Means of verification**>

Counting of number of hours is made by determination of start and end days of energizing time during the monitoring period with interruptions to be adjusted if any based on the on-site confirmation of installation and operation of each transformer. Although the monitoring option is

chosen as Option C in the approved methodology, no measuring equipment is involved and a calibration of the same is not applicable for the measurement methods. The counted number of days is multiplied by 24 hours/day to determine the number of hours during the monitoring period. Therefore, the number of operational days must be counted based on a full day of operation. The counting of day is conducted based on a calendar and there is no issue with accuracy of measurement.

<**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 and regular calibration of the same is not applicable for the monitoring parameter of the project 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 and project emissions, 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 high efficient amorphous transformers in the distribution grid and emission sources are no load losses of grid electricity by reference transformers and project transformers.

The GHG emission reductions during the monitoring period are calculated as: ERp = REp - PEp = 248.7 – 97.7 = 151 tCO2e.

The reference emissions are determined as a product of no load losses of the reference transformers determined on the capacity category and the energizing time, the blackout rate, and CO2 emission factor of the grid electricity.

The project emissions are calculated by no load losses of the project transformers determined on the capacity category, maximum allowable uncertainty for the no load losses of the project transformer, the energizing time, blackout rate, and the CO2 emission factor of the grid electricity.
The CO2 emission factor of the grid electricity is 0.5657 tCO2/MWh as fixed ex-ante at the validation.

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
Hi,p Energizing time of the project transformer i during the period p	0 - 2,184 hours/p for each transformer	Assessment was conducted based on review of implementation completion report of each transformer, records of repair/replacement/re-location, and on site assessment. Please refer to CAR 1 and the resolution details as below.

<Findings>

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

Grade / Ref: CAR 1

Nature of the issue raised: Data monitored did not take account the outage time due to relocation of project transformers. Through the on site assessment of the verification, it was confirmed there was outage time due to relocation during the monitoring period that is not excluded from counting of the energizing time of the project transformers.

Nature of responses provided by the PPs: The PPs submitted the revised MR with supporting evidence of outage time of project transformers due to relocation.

Assessment of the responses: The verification team reviewed the revised MR and the supporting evidence. The outage time of the project transformers was excluded from counting of the energizing time that was confirmed as being in accordance with the relevant records of the

uninstallation, re-installation and energizing at the new locations. Some cases were noted with insufficient evidence and the PPs excluded such cases from counting of the energizing time so that the emission reductions are calculated in a conservative manner.
The total ERs during the monitoring period decreased from 152 tCO2 to 151 tCO2 (by 1 tCO2) in the revised MR.

The CAR was closed while FAR 1 was issued as 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 reference emissions and project emissions 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.
AM0067 Methodology for installation of energy efficient transformers in a power distribution grid that might be applicable to the type of project. There was one CDM Programme of Activity (PoA) registered applying the methodology but it is implemented in Kenya and no similar project located in Vietnam.
Through the processes taken, CAR 3 was raised and subsequently closed 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 3

Nature of the issue raised: A written confirmation is requested from EVNSPC on that the project is not registered under other international climate mitigation mechanisms in addition to the one submitted by YUKO-KEISO Co., Ltd.
Nature of responses provided by the PPs: Written confirmation from EVNSPC dated 30/11/2016 was submitted for review by the verification team.
Assessment of the responses: The verification team confirmed that a written confirmation was submitted by EVNSPC as appropriate. 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 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	248.7	97.7	151
2017			
2018			
2019			
2020			
Total (tCO_2e)			151

F. List of interviewees and documents received

F.1. List of interviewees

YUKO-KEISO Co., Ltd.

Toshihide Sugawara, Director, System Service Department

Shiro Tokura, Director, Business Development Department

Hiromi Kuroyanagi, Business Development Department

Vu Huy Hieu, Engineer, Yuko Vietnam Co. Ltd.

Mitsubishi UFJ Morgan Stanley

Chisato Nakade, Consultant, Clean Energy Finance Division

EVN-SPC

NGUYEN DAC THANG, Deputy Manager, Technical – Production Dept.

HOANG TUAN ANH, Technical – Production Dept. Specialist

Nguyen Huynh An Phu, Technical – Production Dept. Specialist

Nguyen Ngoc Dinh, Deputy Manager, Materials Department

TRUONG XUAN QUY, International Relation Specialist

Le Van Thai, Legal Department Specialist

EVN-SPC Ben Tre Power Company

Pham Thanh True, Deputy Director, Technical Department

Pham Hoang Huan, Deputy Manager, Technical Department

Nguyen Vo Phudi Luan, Technical Department Specialist

F.2. List of documents received

Category A documents (documents prepared by the PP) - MR completed on 01/11/2016 and 06/03/2017 - Outline of the electricity distribution grid and the map - 19 PCs information - Monitoring and reporting structure - EVN SPC standard MBA-03_MBA 3P22/0,4kV (Code: EVN SPC-KTSX/QyD.114) and MBA-01_MBA 1P12,7/0,23kV (Code: EVN SPC-KTSX/QyD.114) - Grid emission factor of Vietnam in 2013 - IEC60076-1 Power Transformers Part 1 General - TCVN6306-1:2006 / IEC60076-1: 2000 Power Transformers Part 1 General - List of transformers - Energization reports - Performance test reports - Pictures of installation - List of transformers re-located - Organisation Chart of EVN-SPC - Maps of provinces/cities indicating locations of transformers installed - Grid Line Map - Records of training - Written confirmation from PPs on avoidance of double registration - Guidance documents of SPC including the instructions, procedures and forms for monitoring and reporting - Records on technical problem and replacement of transformer - Work completion reports for un-installation and re-installation of transformers Category B documents (other documents referenced) - PDD Version 2.0 dated 16/03/2016 with MPS/MSS - Validation Report dated 22/03/2016 - Approved Methodology VN_AM005 “Installation of energy efficient transformers in a power distribution grid” Version 1.0 - Additional information for the proposed methodology “Installation of energy efficient transformers in a power distribution grid”

- JCM Project Cycle Procedure JCM_VN_PCP_ver03.0
- JCM Guidelines for Validation and Verification JCM_VN_GL_VV_ver01.0
- JCM Guidelines for Developing PDD and MR JCM_VN_GL_PDD_MR_ver01.0 and JCM_VN_GL_PDD_MR_ver02.0
- JCM Glossary of Terms JCM_VN_Glossary_ver01.0
- Approved CDM Methodology for installation of energy efficient transformers in a power distribution grid AM0067 Version 02
- Approved Small Scale CDM methodology AMS II.A. Supply-side energy efficiency improvements – transmission and distribution Version 10
- J-Credit methodology for renewal of transformers EN-S-008 Version 1.0

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.

Lloyd's Register
LRQA

Joint Crediting Mechanism Certificate of Appointment

Title of Project: Introduction of amorphous high efficiency transformers in power distribution systems in the southern part of Viet Nam (Project #VN004)
Verification for the first monitoring period: 01/01/2016 – 31/03/2016

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
Nguyen Tri Thang	Expert
Stewart Niu	Technical Reviewer

Signed by

Michiaki Chiba
Climate Change Manager – Asia & Pacific
10/11/2016