JCM Verification Report Form

A. Summary of verification

A.1. General Information

Title of the project	Installation of Tribrid System to mobile communication's Base Transceiver Stations in Republic of Indonesia
Reference number	ID016
Monitoring period	01/01/2018- 31/12/2018
Date of completion of the monitoring report	07/02/2019
Third-party entity (TPE)	Japan Quality Assurance Organization (JQA) (TPE-ID-003)
Project participant contracting the TPE	KDDI Corporation
Date of completion of this report	25/02/2019

A.2 Conclusion of verification and level of assurance

Overall verification opinion	☒ Positive ☐ Negative
☒ Unqualified opinion	Based on the process and procedure conducted, JQA provides reasonable assurance that the emission reductions for Installation of Tribrid System to mobile communication's Base Transceiver Stations in Republic of Indonesia. ✓ 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: Asada	First name: Sumio
Title: Senior Executive	
Specimen signature:	Date: 25/02/2019
[redacted]	

B. Verification team and other experts

	Name	Company	Function*	Scheme competence*	Technical competence*	On-site visit
Mr. ☒ Ms. ☐	Tadashi Yoshida	JQA	Team leader	☒	Authorized	☐
Mr. ☒ Ms. ☐	Irhan Febijanto	External individual	Team member	☒	Authorized	☒
Mr. ☐ Ms. ☒	Sachiko Hashizume	JQA	Internal reviewer	☒	Authorized	☐

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>

The project was registered as a JCM project on 10/07/2018, which applied JCM approved methodology ID_AM014_ver01.0 "Installation of Tribrid Systems to mobile communication's Base Transceiver Stations" under the scheme of Joint Crediting Mechanism between Republic of Indonesia and Japan.

The purpose of the project is to reduce CO_2 emissions from electricity and fossil fuel consumption by introducing Tribrid System to the existing mobile communication's Base Transceiver Stations (BTS) in Republic of Indonesia. Tribrid System consists of solar PV, batteries and electric power control system and has been installed at the 20 BTS sites owned by PT. XL Axiata. This system improves the operational efficiency of the existing diesel generators through the charge-discharge of battery by electric power control system, which contributes to the saving of fuel consumption. Thus, the registered project has achieved 146 tCO_2 of the emission reductions during the monitoring period of 01/01/2018 – 31/12/2018.

The JCM website indicates that the starting date of the project operation is 01/01/2018 and the monitoring period of the project is 01/01/2018 - 31/12/2018. The starting dates of all BTS sites are included in this monitoring period. It is confirmed through the review of relevant documents, on-site assessment and the interview with the PPs that the monitoring of

the project activity at each BTS site actually started on and after 01/01/2018.

JQA has assessed whether the project implementation and operation during the monitoring period complies with the eligibility criteria of the applied methodology. After desk review, an on-site assessment for the BTS sites No. 1, 2 and 15 randomly selected was conducted on 22-24/01/2019. JQA conducted a physical inspection and interviewed with the PPs listed in Section F of this verification report.

The assessment results regarding the eligibility criteria are summarized as below:

Criterion 1

The project installs Tribrid system(s) to new and/or existing BTS.

Through the review of Acceptance Test Report, on-site inspection and the interview with the PPs during on-site assessment, the project information of Criterion 1 in the PDD is confirmed as follows:

- The installation of Tribrid system at the existing 20 BTS sites was completed by the end of January 2018.

Hence, it is concluded that the project meets Criterion 1 with a satisfactory result during the monitoring period.

Criterion 2

The project BTS is located at the telecom tower sites equipped with diesel generator.

Through the review of Acceptance Test Report, on-site inspection and the interview with the PPs, the project information of Criterion 2 in the PDD is confirmed as follows:

- The existing 20 BTS sites where Tribrid system has been installed by the project are located at the telecom tower sites equipped with diesel generator, which are owned by PT. XL Axiata Tbk.

Hence, it is concluded that the project meets Criterion 2 with a satisfactory result during the monitoring period.

Criterion 3

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) at the time of validation based on the latest version of international or national standard.

Through the review of the relevant documents and the interview with the PPs during on-

site assessment, the project information of Criterion 3 in the PDD is confirmed as follows:

- The PV modules installed by the project have been certified with design qualification (IEC 61215) and safety qualification (*IEC 61730*) at the time of validation.

Hence, it is concluded that the project meets Criterion 3 with a satisfactory result during the monitoring period.

Criterion 4

The battery installed by the project is Li-ion battery.

Through the review of Acceptance Test Report, on-site inspection and the interview with the PPs, the project information of Criterion 4 in the PDD is confirmed as follows:

- The lead-acid batteries used at the 20 BTS sites were replaced with Li-ion batteries by the end of January 2018.

Hence, it is concluded that the project meets Criterion 4 with a satisfactory result during the monitoring period.

Criterion 5

In the case of replacing existing Lead-Acid battery with the project Li-ion battery, lead contained in existing Lead-Acid battery is not released to the environment.

Through the review of the Standard of Procedures (SOP), on-site inspection and the interview with the PPs, the project information of Criterion 5 in the PDD is confirmed as follows:

- The lead-acid batteries replaced with the project Li-ion battery were re-used at other BTS sites or stored in warehouse. Therefore, no lead has been released to the environment.

Hence, it is concluded that the project meets Criterion 5 with a satisfactory result during the monitoring period.

Regarding Criterion 5, JQA raised CL 04 and this issue was resolved as explained in "Findings".

<Findings>

< CL 04 >

The PPs are requested to provide records on the re-use or storage of lead-acid battery

which was replaced with Li-ion battery at each BTS site.

< Resolution by the PPs >

The record is provided in Section (2) 3 of the Acceptance Test Report (page 3).

< Assessment by the TPE >

It is confirmed through the review of Acceptance Test Report, on-site inspection and the interview with the PPs that the lead-acid batteries replaced with Li-ion batteries at each BTS site have been stored in warehouse and appropriately controlled not to be released to the environment. Thus, CL 04 is closed.

<Conclusion based on reporting requirements>

JQA concludes that the implementation and the operation of the registered project are in compliance with five eligibility criteria of the applied methodology ID_AM014 during this monitoring period.

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

<Means of verification>

JQA has assessed the status of the actual project and its operation with the registered PDD through the review of the relevant documents, on-site inspection and interviews with the PPs. The project is implemented by the PPs of PT. XL Axiata Tbk. from Republic of Indonesia and KDDI Corporation from Japan.

The assessment results are summarized as follows;

[Physical features of the project]

KDDI Corporation and PT. XL Axiata Tbk. have installed Tribrid system to the existing 20 BTS sites equipped with diesel generator in order to reduce CO_2 emissions from electricity and fossil fuel consumption at the sites. Tribrid system consists of solar PV, Li-ion battery and electric power control system, and controls charge-discharge of battery, and optimizes the efficiency of diesel generator. The installation of the project equipment at the existing 20 BTS sites was completed by the end of January 2018, which complies with the description of the registered PDD.

JQA confirms through the on-site inspection of three sites (No. 1 Pulau Putri, No.2 Pulau Pantara and No. 15 Bukit Barapung) and interview with the PPs for the first verification that

the physical features of the project are in place and the PPs have implemented the project according to the registered PDD.

[Monitoring points]

Following monitoring parameters are measured by current sensor, sensor logger and oil filling record to the fuel tank, in accordance with the monitoring plan.

1. $EC_{i,grid,p}$: Amount of grid electricity consumed at BTS *i* during the period *p* [MWh/p]
2. $EC_{i,diesel,p}$: Amount of electricity generated by the project diesel generator at BTS *i* during the period *p* [MWh/p]
3. $EC_{i,solar,p}$: Amount of electricity generated by the project solar PV system at BTS *i* during the period *p* [MWh/p]
4. $\tau_{i,p}$: Hours for which electricity is available from grid at BTS *i* during the period *p* [h/p]
5. $T_{i,p}$: Total hours of operation of BTS *i* during the period *p* [h/p]
6. $FC_{i,diesel,p}$: Quantity of diesel consumption at BTS *i* during the period *p* [L/p]

It is confirmed through the review of Acceptance Test Report, on-site inspection and interview with the PPs that the current sensor and sensor logger have been installed at the 20 BTS sites to measure electricity consumption from the grid and electricity generation from solar PV and diesel generator, and to measure hours for importing electricity from the grid. The fuel consumption for diesel generator has been recorded by the staff when the fuel is re-filled into the tank. The monitoring points for these parameters are properly located at the diesel generator, solar PV, fuel tank and sensor logger for off-grid sites and are located at the entrance of the grid, diesel generator, solar PV, fuel tank and sensor logger for poor grid sites. The measured data except diesel fuel consumption is automatically stored by the logger at the BTS site and transmitted continuously to the server at KDDI Corporation for monthly aggregation.

[Monitoring structure]

The monitoring structure has been established and the roles and responsibilities of the personnel are consistent with the description in Monitoring Structure Sheet. The staff training for operation, monitoring and maintenance of the system was conducted in March 2018.

It is confirmed through the review of relevant documents and the interview with the PPs that the monitoring activity has been appropriately implemented during the monitoring period, in line with the monitoring plan of the registered PDD.

Regarding the starting date of the monitoring period, JQA raised CL01 and CL 02 and these issues were resolved as explained in "Findings".

<Findings>

< CL 01 >

The starting dates of the monitoring period in the MRS for the BTS sites (No.4-6, 8, 11, 12, 14, 15, 17-20) are not consistent with those in the PDD.

< Resolution by the PPs >

The monitoring periods of these BTS sites in the MRS have been corrected to be consistent with those in the PDD.

< Assessment by the TPE >

It is confirmed through the review of the revised MRS and the relevant document that the starting date of the monitoring period in the MRS for these BTS sites is appropriately corrected to be consistent with those in the PDD and further the monitoring activities were actually commenced through the download from the FTP servers equipped at the 20 BTS sites. Thus, CL 01 is closed.

< CL 02 >

The starting dates of the monitoring period in the MRS for the BTS sites (No.7, 10-12, 17, 19, 20) are set before the date of the acceptance test.

< Resolution by the PPs >

For these sites, the acceptance test was conducted after installation and start of monitoring due to site location and resources. The starting date of monitoring activity is confirmed by the date of receiving data from the FTP server.

< Assessment by the TPE >

It is confirmed through the review of relevant documents and the interview with the PPs that the acceptance tests for these BTS sites were delayed after the starting date of monitoring activity due to some difficulties to access these sites and shortage of resources. Thus, CL 02 is closed.

<Conclusion based on reporting requirements>

JQA concludes that the project has been implemented in accordance with the registered PDD during the monitoring period, and no changes are found from the description of the

registered PDD.

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

<Means of verification>

The electricity generated by the solar PV is measured by current sensor (HCS-36-500-AP) made by United Research and Development (U_RD). The consumption of electricity from the grid and the diesel generator is measured by average commutation type current exchanger (CTT-16-CLS-CV100) made by U_RD. The specification of the current sensor and average commutation type current exchanger has been certified by the manufacturer at the time of shipping. And, hours for which electricity is available from grid at BTS_i are also counted by the sensor logger.

It is confirmed through the review of the relevant documents, on-site inspection and the interview with the PPs that the specifications of these measuring equipment have been provided by the PPs by the time of installation, in accordance with the monitoring plan of the registered PDD, and further these measuring equipment were certified by the manufacturer at the time of shipping. Therefore, JQA concludes that no correction of measured values for electricity data, hours for electricity import from the grid and diesel consumption is required in the calculation of emission reductions.

<Findings>

No issue was identified.

<Conclusion based on reporting requirements>

JQA concludes that the specification of measuring equipment described above has been provided at the time of installation and certified by the manufacturer in accordance with the monitoring plan of the registered PDD. Therefore, no correction of the measured values is required in the calculation of emission reductions.

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

<Means of verification>

JQA has assessed the data and calculation of GHG emission reductions achieved by the project activity as follows:

(a) The corresponding Monitoring Report Sheet of the applied methodology has been used;

Through the review of the monitoring report for the project which is titled as JCM_ ID016_MP_MRS_02132019.xlsx, it is confirmed that the Monitoring Report Sheets (MRS(input), MRS(calc_process) of applied methodology ID_AM014 are appropriately used.

(b) A complete set of data for the monitoring period for all parameters monitored ex post was provided to the verification team in the form of several kinds of files.

Monitoring Report Sheet (MRS) and supporting documents provided by the PPs contains a complete set of the monitored data on electricity generation/consumption from diesel generator, solar PV and grid, hours for which electricity is available from grid, total hours of operation of BTS and diesel fuel consumption for each BTS site except 2 sites (No. 7 and No. 16) during the monitoring period.

It is confirmed through the review of these monitored data that the electricity generation/ consumption, hours for electricity import from grid, total hours of BTS operation and diesel fuel consumption are fully provided for the monitoring period, except 2 sites (No. 7 and No. 16).

(c) Information provided in the monitoring report has been checked with sources such as plant logbooks, inventories, purchase records, laboratory analysis;

In order to check the correctness of monitored data given in the MRS for electricity generation/consumption ($EC_{i,grid,p}$, $EC_{i,disel,p}$, $EC_{i,solar,p}$,), hours for electricity import from grid ($\tau_{i,p}$), total hours of BTS operation ($T_{i,p}$) and diesel fuel consumption ($FC_{i,diesel,p}$), JQA has cross-checked these monitored data with the sum of monthly data for the monitoring period which are downloaded from the server. As a result of cross-checking, there were no material errors in the value of each monitoring parameter between the MRS and monthly data record.

According to the paragraph 101 of JCM Guidelines for Validation and Verification (JCM_ ID_GL_VV_ver01.0), the threshold of materiality for verification is set at 5% of emission reductions. The sum of emission reductions from the 20 BTS sites in the MRS is 146.0 tCO_2, whereas the sum of emission reductions calculated from the monthly data is 146.5 tCO_2. The difference between both values is 0.5 tCO_2., which corresponds to 0.3% (= (146.5 - 146.0)/ 146.0 x 100) of the emission reductions for the project. This error is less than 5% of the materiality threshold.

Therefore, JQA concludes that the value of emission reductions achieved by the project is free from material errors or omissions with a reasonable level of assurance.

(d) Any assumptions used in emission calculations have been justified;

Through the review of the MRS and the interview with the PPs, it is confirmed that no assumption has been used in the calculations of emission reductions and hence no justification is required.

(e) Appropriate emission factors, default values, and other reference values have been correctly applied.

Through the review of the MRS and the interview with the PPs, it is confirmed that design efficiency of diesel generator operated at the project BTS at the time of validation at 25% load (ϕ_i), grid CO_2 emission factor (*ex-post*) in 2015 (EF_{grid}) and weight average density of diesel (ρ_{diesel}), which were determined at the time of validation and provided in the MPS, have been correctly applied in the calculation of reference emission or project emission. Further, it is also confirmed that the net calorific value (NCV_{diesel}) and diesel CO_2 emission factor (EF_{diesel}) are sourced from the lower value in Table 1.2 and Table 1.4 of 2006 IPCC, respectively, and these values are correctly applied in the calculation of reference and project emissions.

The data monitored and required for verification and issuance is to be kept and archived electronically for two years after the final issuance of credits.

Regarding fuel consumption data, decreased emission reductions and the missing of monitoring period in the MRS, JQA raised CAR 01, CAR 02, CL 03 and CL 05 and these issues were resolved as explained in "Findings".

<Findings>

< CAR 01 >

For daily average fuel consumption data in fuel summary sheet, there are miscalculation in the BTS sites of No.10 on 2/2/2018-6/2/2018, No.11 on 2/2/2018-6/2/2018, No.15 on 4/10/2018, No.16 on 8/11/2018-10/11/2018, No.19 on 8/11/2018-10/11/2018 and No.20 on 29/01/2018-14/02/2018 and 11/06/2018-04/09/2018.

< Resolution by the PPs >

The data of daily average fuel consumption was corrected based on the monitoring record.

< Assessment by the TPE >

It is confirmed through the review of the revised fuel summary sheet that the data of daily average fuel consumption for these BTS sites are correctly calculated. Thus, CAR 01 is

closed.

< CAR 02 >

The total values of RE, PE and ER are not provided in the cells (E24, F24 and G24) of "MRS Summary Table" sheet of Monitoring Spreadsheet.

< Resolution by the PPs >

Due to the protection by the JCM secretariat, the "MRS Summary Table" sheet cannot be edited by the PPs.

< Assessment by the TPE >

Due to the exclusion of the monitoring data for the BTS sites (No.7 and No. 16) caused by the abnormal operation of diesel generator during the monitoring period, the "MRS Summary Table" sheet of Monitoring Spreadsheet is not completed and therefore the total amount of the emission reductions for the 20 BTS sites achieved by the registered project is not provided.

However, as Section E of the Verification Report requests the input of the verified amount of emission reductions achieved by the project, the values of RE, PE and ER should be provided in the "MRS Summary Table" sheet. The RE for the BTS sites (No. 7 and No. 16) can be calculated by inputting negligibly small value to the parameter $T_{i,p}$ in the MRS and, as a result, the values of RE, PE and ER for the 20 BTS sites are provided in the "MRS Summary Table" sheet and accordingly the total emission reduction is calculated. Thus, CAR 02 is closed.

< CL 03 >

The PPs are requested to explain the large difference in the emission reductions between ex-post and ex-ante values.

< Resolution by the PPs >

The reasons were explained by the document No.21.

< Assessment by the TPE >

It is confirmed through the review of the document No. 21 and the measured data and the interview with the PPs that the large difference in the emission reductions between *ex-post* and *ex-ante* values for off-grid BTS sites are mainly caused by the increase in oil consumption by diesel generator. The reasons for the increase are: 1) lower generation efficiency due to poor maintenance of the generator, 2) increased operation time of the generator as a result of insufficient charge of Li-ion battery due to deterioration of the rectifier, 3) overnight operation of the generator due to a security problem outside the BTS site, and 4) increased operation time

of the generator due to the air conditioning problem. Thus, CL 03 is closed.

< CL 05 >

The date of the monitoring period is not provided in the cell (B26) of MRS (input) for every BTS site.

< Resolution by the PPs >

The date of monitoring period was input in the cell (B26) of the MRS for every BTS site.

< Assessment by the TPE >

It is confirmed through the review of the revised MRS that the date of the monitoring period is appropriately provided in the cell (B26) of MRS (input) for every BTS site. Thus, CL 05 is closed.

<Conclusion based on reporting requirements>

JQA concludes that the monitored data and the project-specific parameters fixed *ex-ante* are appropriately and correctly applied in the calculation of GHG emission reductions achieved by the project activity, in accordance with the applied methodology ID_AM014 and the monitoring plan of the registered PDD.

C.5. Assessment of avoidance of double registration

<Means of verification>

It is confirmed that a written confirmation from the PPs regarding no registration under other international climate mitigation mechanisms was provided at the time of validation and the declaration letter signed by the PP's representative in the MoC was submitted to the Joint Committee. In addition, it is re-confirmed through the check of the relevant website and the interview with PPs that the project has not been registered under any other mechanisms at the time of verification.

<Findings>

No issues was identified.

<Conclusion based on reporting requirements>

JQA concludes that the project has not been registered under other international climate mitigation mechanisms.

C.6. Post registration changes

<Means of verification>

It is confirmed through the review of documents and the on-site assessment that the project has not been changed from the registered PDD and/or methodology.

<Findings>

No issue was identified.

<Conclusion based on reporting requirements>

JQA concludes that the project has not been changed from the registered PDD and/or 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 issues including FAR from the validation are remained. As this is the first verification, no issues from the previous verification are also remained.

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	526.1	380.0	146
2019	-	-	-
2020	-	-	-
Total (tCO_2e)			146

Note: The verified emission reductions in each year are rounded down after the decimal point.

F. List of interviewees and documents received

F.1. List of interviewees

- Imam Yulianto	Operational Engineer, PT. XL AXIA
- I Made Wirantika	Operational Engineer, PT. XL AXIA
- Andre Saru	Operational Engineer, PT. XL AXIA
- Syed Bilal	GM SOP & P&I, PT. Huawei Service
- Rinto Adi P	Manager PCI, PT. Huawei Service
- Hiroyasu Morishita	General Manager Southeast Asian Bloc Group, KDDI
- Hiromi Imanari	Senior Manager Southeast Asian Bloc Group, KDDI
- Kemisa Darmosentono	Manager, KDDI Indonesia
- Akiko Ishii	Manager Climate Change and Sustainability Service, Ernst & Young Japan

F.2. List of documents received

1. JCM Project Design Document (ID016) _ver2.1, 23/02/2018
2. Monitoring Spreadsheet: JCM_ID016_MPMRS_13/02/2019.xlsx
3. JCM Validation Report (ID016), 30/03/2018
4. JCM Modalities of Communication Statement Form (MoC), 24/01/2018
5. JCM Approved Methodology JCM_ID_AM014_ver1.0
6. JCM Glossary of Terms (JCM_ID_Glossary_ver02.0)
7. JCM Project Cycle Procedure (JCM_ID_PCP_ver05.0)
8. JCM Guidelines for Developing Project Design Document and Monitoring Report (JCM_ID_GL_PDD_MR_ver03.0)
9. JCM Guidelines for Validation and Verification (JCM_ID_GL_VV_ver01.0)
10. JCM Verification Report Form (JCM_ID_F_Vrf_Rep_ver01.1)
11. Monthly monitoring data of each monitoring parameter for the 20 BTS sites

12-1. Diesel fuel consumption data of the 20 BTS sites

12-2. Record of electricity generation by diesel generator and solar PV and electricity import from the grid

13. Summary of Acceptance Test Record for the 20 BTS sites
14. Acceptance Test Report of the 20 BTS sites
15. Start date of data download from the server for the 20 BTS sites

16-1. Tribrid training manual, March 2018, prepared by GICT Business promotion dept.

16-2. Monitoring data collection system from the server

17-1. Fuel consumption of diesel generator at 25% load

17-2. Sample of fuel invoice for Gunung Keramaian (No. 3 BTS site)
17-3. Photo of fuel oil tank for diesel generator at Sungsang (No. 13 BTS site)
17-4. Measuring method of oil fuel in the tank at Sungsang (No. 13 BTS site)
18-1. Specification of datalogger (Model: GL840) manufactured by Graphtec Corporation
18-2. Data acquisition system by datalogger
19-1. Specification of current sensor (Model: HCS-36-200-AP), United Research and Development
19-2. Specification of current rectifier (Model: CTT-16-CLS-CV100), United Research and Development
20. Storage of lead-acid battery replaced with Li-ion battery
21. Specification of electricity meter installed at the monitoring point 2
22. Explanation of difference between *ex-ante* and *ex-post* emission reductions

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.

Statement of competence

Name: Dr. Tadashi Yoshida

Qualified and authorized by Japan Quality Assurance Organization.

Function	Date of qualification
Validator	2014/12/22
Verifier	2014/12/22
Team leader	2014/12/22

Technical area within sectoral scopes	Date of qualification
TA 1.1. Thermal energy generation	2014/12/22
TA 1.2. Renewables	2014/12/22
TA 3.1. Energy demand	2014/12/22
TA 4.1. Cement and lime production	2015/11/12
TA 4.6. Other manufacturing industries	2014/12/22
TA 5.1. Chemical industry	2014/12/22
TA 10.1. Fugitive emissions from oil and gas	2014/12/22
TA 13.1. Solid waste and wastewater	2014/12/22
TA 14.1. Afforestation and reforestation	-

Statement of competence

Name: Dr. Irhan Febijanto

Qualified and authorized by Japan Quality Assurance Organization.

Function	Date of qualification
Validator (JCM project only)	2017/8/21
Verifier (JCM project only)	2017/8/21
Team leader	-

Technical area within sectoral scopes	Date of qualification
TA 1.1. Thermal energy generation	2014/12/22
TA 1.2. Renewables	-
TA 3.1. Energy demand	2014/12/22
TA 4.1. Cement and lime production	-
TA 4.6. Other manufacturing industries	-
TA 5.1. Chemical industry	-
TA 10.1. Fugitive emissions from oil and gas	-
TA 13.1. Solid waste and wastewater	-
TA 14.1. Afforestation and reforestation	-

Statement of competence

Name: Ms. Sachiko Hashizume

Qualified and authorized by Japan Quality Assurance Organization.

Function	Date of qualification
Validator	2015/11/20
Verifier	2015/11/20
Team leader	2018/6/22

Technical area within sectoral scopes	Date of qualification
TA 1.1. Thermal energy generation	2015/11/20
TA 1.2. Renewables	2015/11/20
TA 3.1. Energy demand	2015/11/20
TA 4.1. Cement and lime production	-
TA 4.6. Other manufacturing industries	-
TA 5.1. Chemical industry	-
TA 10.1. Fugitive emissions from oil and gas	-
TA 13.1. Solid waste and wastewater	2015/11/20
TA 14.1. Afforestation and reforestation	-