# JCM Verification Report Form

## A. Summary of verification

A.1. General Information

| | |
|---|---|
| Title of the project | Power generation by waste heat recovery in the PT Semen Indonesia (Persero) Tbk factory in Tuban |
| Reference number | ID013 |
| Monitoring period | 01/07/2018 - 31/12/2018 |
| Date of completion of the monitoring report | 01/03/2019 |
| Third-party entity (TPE) | Japan Quality Assurance Organization (TPE-ID-003) |
| Project participant contracting the TPE | JFE Engineering Corporation |
| Date of completion of this report | 19/03/2019 |

A.2 Conclusion of verification

| | |
|---|---|
| Overall verification opinion | ☒ Positive<br>☐ Negative |
| ☒ Unqualified opinion | Based on the process and procedure conducted, JQA provides reasonable assurance that the emission reductions for Power generation by waste heat recovery in the PT Semen Indonesia (Persero) Tbk factory in Tuban<br>✓ Are free of material errors and are a fair representation of the GHG data and information, and<br>✓ 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.)*<br>☐ Qualified Opinion<br>☐ Adverse opinion<br>☐ Disclaimer | <State the reasons> |

A.3. Overview of final verification conclusion

| Item | Verification requirements | No CAR or CL remaining |
|---|---|---|
| The project implementation with the eligibility criteria of the applied methodology | The project implementation 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 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: [redacted] | Date: 19/03/2019 |

## 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 verification 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 verification.*

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

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

**<Means of verification>**

The implemented project was registered as a Joint Crediting Mechanism (hereinafter referred to as JCM) project on 10/07/2018 which applied JCM approved methodology of ID_AM001_ver01.0, "Power Generation by Waste Heat Recovery in Cement Industry" under the scheme of JCM between Republic of Indonesia and Japan.

The purpose of the project is to reduce $CO_2$ emission emitted by the regional grid system by introducing electricity generated by waste heat recovery (WHR) system installed at PT. Semen Indonesia (Persero) Tbk in Tuban, Indonesia. Four units of WHR system and one unit of steam turbine and generator are installed. The WHR system consists of SP boiler recovering waste heat from suspension preheater and AQC boiler recovering waste heat from air quenching cooler. Electricity generated by the Waste Heat Recovery Power Generation (hereinafter referred to as WHRPG) system is 16,389 MWh (=32,684 MWh – (3.69 MW x 24 hrs/day x 184 days)), which contributes to the reduction of 2.6% (=16,389 MWh/623,512 MWh) of the electricity imported from the grid. The saving of electricity import resulted in the reduction of $CO_2$ emission from the grid, which is 14,799 $tCO_2$ for the first monitoring period.

According to the JCM website and the registered PDD, the starting date of the

project operation is 30/04/2018. However, as shown in the MRS, the actual monitoring activity commenced on 01/07/2018 and the first monitoring period was determined as the period of 01/07/2018 - 31/12/2018. It is confirmed through the review of the "Work completion report of the JCM project" and the interview with the PPs during the on-site visit on 29/01/2019 that the starting date of the monitoring activity was postponed from 30/04/2018 to 01/07/2018, due to the delay of the installation of the equipment and the subsequent test operation of the WHRPG system.

Regarding the inconsistency of the starting date of the project operation between the registered PDD and the MRS, JQA raised CL 04 and the issue was resolved as explained in "Findings".

The methodology consists of six eligibility criteria as shown below. JQA assessed the compliance of the project implementation with the eligibility criteria through the desk review, the interview with PPs and the on-site assessment, and the result is summarized as below.

Criterion 1

*The project utilizes waste heat from the cement production facility by waste heat recovery (WHR) system to generate electricity.*

Through the review of Design of General Arrangement and Process Flow Diagram of WHRPG at Tuban cement factory, the interview with PPs and physical observation during the on-site assessment, the project information of Criterion 1 in the PDD is confirmed as follows.

- Four units of WHR system have been installed for four unit of kilns at Tuban cement factory. Waste heat with a temperature of 400°C recovered from preheater tower is utilized to generate steam in SP boiler and waste heat with a temperature of 300°C recovered from clinker cooler is utilized to generate steam in AQC boiler. Steam generated from four units of SP boiler and four units of AQC boiler are collected to the header and supplied to the unit of steam turbine and generator for generating electricity to reduce the consumption of electricity imported from the grid.

Hence, JQA concludes that Criterion 1 is fully satisfied during the monitoring period.

Criterion 2

*WHR system consists of a Suspension Preheater boiler (SP boiler) and/or Air Quenching Cooler boiler (AQC boiler), turbine generator and cooling tower.*

Through the review of Design of General Arrangement of WHR and Process Flow Diagram of each WHR at Tuban cement factory, the interview with PPs and the physical observation during the on-site assessment, the project information of Criterion 2 in the PDD is confirmed as follows.

- WHRPG system consists of four units of Suspension Preheater boiler (SP boiler), four units of Air Quenching Cooler boiler (AQC boiler), one unit of steam turbine and generator with a capacity of 30.6 MW, and cooling tower have been installed at Tuban cement factory.

Hence, JQA concludes that Criterion 2 is fully satisfied during the monitoring period.

Criterion 3

*WHR system utilizes only waste heat and does not utilize fossil fuels as a heat source to generate steam for power generation.*

Through the review of the relevant document, the interview with PPs and physical observation during the on-site assessment, the project information of Criterion 3 in the PDD is confirmed as follows.

- Four units of WHR system utilize only waste heat recovered from preheater tower and clinker cooler, and do not utilize fossil fuel as a heat source to generate steam for power generation.

Therefore, JQA concludes that Criterion 3 is fully satisfied during the monitoring period.

Criterion 4

*WHR system has not been introduced to a corresponding cement kiln of the project prior to its implementation.*

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Through the review of the photos around the kiln before introducing the WHRPG system and the interview with PPs during the on-site assessment, the project information of Criterion 4 in the PDD is confirmed as follows.

- WHR system has not been introduced to a corresponding cement kiln of the project prior to its implementation at Tuban cement factory.

Therefore, JQA concludes that Criterion 4 is fully satisfied during the monitoring period.

Criterion 5

*The cement factory where the project is implemented is connected to a grid system and the theoretical maximum electricity output of the WHR system, which is calculated by multiplying maximum electricity output of the WHR system by the maximum hours per year (24 x 365 = 8,760 hours), is not greater than the annual amount of the electricity imported to the cement factory from the grid system:*

- *During the previous year before the validation, if the validation of the project is conducted before the operation of the project, or*
- *During the previous year before the operation of the project, if the validation of the project is conducted after the operation of the project.*

Through the review of the relevant document and the interview with PPs during the on-site assessment, the project information of Criterion 5 in the PDD is confirmed as follows.

- The theoretical maximum electricity output of the WHRPG system was 235,731 MWh (= (30.6-3.69) x 8,760 hr/p), which is much less than 1,217,155 MWh of the amount of the electricity imported from the grid during the previous year of the validation (01/01/2016-31/12/2016) at Tuban cement factory. During the monitoring period (01/07/2018-31/12/2018), the net electricity generated by WHRPG system was 16,389 MWh, which is much less than 623,512 MWh of the electricity imported from the grid at Tuban cement factory.

Therefore, JQA concludes that the registered project implementation complies with Criterion 5 during the monitoring period.

Criterion 6

*The WHR system is designed to be connected only to an internal power grid of the cement factory.*

Through the review of the single line diagram of WHRPG and the interview with PPs during the on-site assessment, the project information of Criterion 6 in the PDD is confirmed as follows.

- The WHPRG is only connected and supplied to the internal power grid of Tuban cement factory. During the monitoring period, 32,684 MWh of electricity was generated by WHPRG and the net electricity, *i.e.*, 16,389 MWh, was supplied to the internal power grid. Consequently, the electricity generated by WHPRG reduced 2.6 % (=16,389 MWh/623,512 MWh) of electricity imported from the grid, which corresponds to the emission reduction of 14,799 $tCO_2$.

Therefore, JQA concludes that the registered project implementation complies with Criterion 6 during the monitoring period.

Regarding the value of $EG_{SUP,p}$ and monitoring period in the MRS, JQA raised CAR 01 and CAR 02 and these issues were resolved in “Findings”.

<***Findings***>

***<CAR 01>***

The value of $EG_{SUP,p}$ (50,161 MWh) in the MRS is not consistent with the sum of monthly electricity data (32,684 MWh) during the monitoring period.

***<Resolution by the PPs>***

The PPs have provided the revised MRS, and the value of $EG_{SUP,\ P}$ has been corrected to the value of 32,684 MWh/p.

***<Assessment by the TPE>***

It is confirmed through the review of the revised MRS that the value of $EG_{SUP,p}$ is consistent with the sum of monthly electricity data, *i.e.*, 32,684 MWh. Thus, CAR 01 is closed.

***<CAR 02>***

The date of monitoring period is not provided in the cell (B19) of the MRS.

***<Resolution by the PPs>***

The PPs have provided the revised MRS, and the date of monitoring period (1/7/2018-31/12/2018) in the cell (B19) has been properly described.

***<Assessment by the TPE>***

It is confirmed through the review of the revised MRS that the date of monitoring period is appropriately provided in the cell (B19). Thus, CAR 02 is closed.

***<CL 04>***

The PPs are requested to explain about the inconsistency of the starting date of the project operation between the registered PDD (30/04/2018) and the MRS (01/07/2018).

***<Resolution by the PPs>***

The PPs have provided the "Work completion report of the JCM project" issued by JFE Engineering Corporation, dated 13/07/2018, and explained that the postponement of the starting date was due to the delay of installation work of the project equipment and the test operation of the WHRPG system.

***<Assessment by the TPE>***

It is confirmed through the review of the "Work completion report of the JCM project" and the interview with the PPs during the on-site visit that the installation work of the project equipment and the subsequent test operation of the WHRPG system were completed on 30/06/2018. Therefore, the starting date of the monitoring activity was postponed to 01/07/2018 because of the delay of the work completion. It is also confirmed through the review of the logbook data that the monitoring activity actually started on 01/07/2018. Thus, CL 04 is closed.

**<Conclusion based on reporting requirements>**

JQA concludes that the implementation and the operation of the registered project comply with six eligibility criteria of the applied ID_AM001_ver01.0 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 implementation against the registered PDD through the review of the relevant document, the on-site assessment and the interview with the PPs. The project is implemented by the project participants of PT. Semen Indonesia (Persero) Tbk. from Republic of Indonesia and JFE Engineering Corporation from Japan.

The assessment results are summarized below.

**[Physical features of the project]**

PT Semen Indonesia has installed WHPRG at Tuban cement factory, which utilizes waste heat recovered from preheater tower and clinker cooler to generate steam for power generation. The generated electricity is consumed for the facility of Tuban cement factory. Consequently, it reduces the amount of electricity imported from the grid and reduces $CO_2$ emission emitted from the grid. WHPRG consists of four units of Suspension Preheater boiler (SP boiler), four units of Air Quenching Cooler boiler (AQC boiler), one unit of steam turbine and generator with a capacity of 30.6 MW, and cooling tower. All facility has been successfully installed, which complies with the description of the registered PDD.

JQA have confirmed through the on-site assessment for the first verification that the physical features of the project are in place and the PPs have implemented the project as per the registered PDD.

**[Monitoring points]**

Only one monitoring parameter is measured by electricity meter, in accordance with the monitoring plan.

1. $EG_{SUP,p}$ : Quantity of the electricity supplied from the WHR system to the cement production facility during a given time period *p* [MWh/p]

The measurement equipment is located in the control room. The monitored data is transmitted automatically to the server and the daily data of $EG_{SUP,p}$ is recorded manually by the operator for the backup. The number of days during a given time period *p* (Dp) for electricity generation is counted once at the end of this monitoring period.

**[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 training for the operation of WHRPG was conducted during 11-12/01/2017. The materials and certificates of staff training for operation, monitoring and maintenance of WHPRG have been confirmed.

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.

**<Findings>**

No issue was identified

**<Conclusion based on reporting requirements>**

JQA has assessed and confirmed that the registered project has been implemented in line with the registered PDD during the monitoring period. 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 measuring equipment used for monitoring in the project activity is Electricity Meter (model: Power Logic ION8650) made by Schneider Electric. The equipment was calibrated at the time of shipping and certified on 12/08/2015 by the manufacturer, in accordance with Schneider Electric's verification procedures. Therefore, the correction of the measured value is not required in the calculation of emission reductions.

It is confirmed through the review of relevant documents and the interview with the PPs that the electricity meter is appropriately calibrated and does not require additional calibration after installation as specified by the manufacturer's recommendation.

Regarding the source of calibration procedures, frequency and the calibration certificate of the measuring equipment, JQA raised CL 02 and CL03 and these issues were resolved in "Finding" below.

**<Findings>**

***<CL 02>***

The PPs are requested to provide the source on the calibration method and calibration frequency such as international standards, manufacturer's spec or in-house procedure.

***<Resolution by the PPs>***

The PPs have provided Technical Note of Power Logic ION8650 electricity meter to explain about calibration requirement of the electricity meter.

***<Assessment by the TPE>***

It is confirmed that that the additional calibration of the meter after installation is not required in accordance with Technical Note of Power Logic ION8650 electricity meter. Thus, CL 02 is closed.

***<CL 03>***

The PPs are requested to provide the calibration certificates of electricity meter in 2017 and 2018, if the calibration is to be conducted annually.

***<Resolution by the PPs>***

The PPs have explained based on the Technical Note of Power Logic ION8650 electricity meter that the calibration of the meter is not required after calibration at the time of shipping.

***<Assessment by the TPE>***

It is confirmed that that the calibration of the meter is not required in accordance with Technical Note of Power Logic ION8650 electricity meter. The meter was calibrated by the manufacturer at the time of shipping on 12/08/2015, in accordance with Schneider Electric's verification procedures. Thus, CL 03 is closed.

**<Conclusion based on reporting requirements>**

JQA concludes that the meter has been certified by the manufacturer in accordance with the monitoring plan of the registered PDD. Therefore, the correction of the measured values is not 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 file for the project which is titled as 02_JCM_ID_AM001_ver01.0_JFEE_7-12_2018_190207_r1.xlsx, it is confirmed that the Monitoring Report Sheets (MRS (input) and MRS (calc_process) of the applied methodology of ID_ AM001_ver01.0 are used appropriately.

*(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 the monitored data on electricity supplied from the WHRPG system to the cement production facility and the number of days during the monitoring period.

It is confirmed through the review of the monitored data on electricity and the number of days are fully provided for the monitoring period.

*(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 ($EG_{SUP,p}$,) given in the MRS, JQA has cross-checked the monitored data with the sum of monthly data during the monitoring period recorded in the logbook data. As a result of cross-checking, there were no errors in the amount of electricity between the MRS and the monthly data record.

*(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

the *ex-ante* parameter of $CO_2$ emission factor for the regional grid in the project activity ($EF_{grid}$) taken from the list of grid emission factor for power interconnection systems in 2015 issued by Directorate General of Electricity, Ministry of Energy and Mineral Resources, Indonesia, and the total maximum rated capacity of equipment of WHR system ($EC_{CAP}$), except for the equipment which use the electricity generated by itself directly, were determined at the time of validation and applied in the MPS. They have been used correctly in the calculation of reference emission.

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 the difference in the emission reductions between *ex-ante* and *ex-post,* JQA raised CL 01 and the issue was resolved as explained in "Findings" below.

**<Findings>**

***<CL 01>***

The PPs are requested to explain the large difference between estimated emission reductions (74,531 $tCO_2$ for six months) and actual emission reductions (14,799 $tCO_2$) during the monitoring period.

***<Resolution by the PPs>***

PPs have explained about the cause of considerable decrease in emission reductions for this monitoring period as follows:

"Due to the technical problems happened in some ducts which supply waste heat from preheater tower to the SP boilers, the quantity of waste heat recovered from the preheater tower was significantly reduced during the monitoring period. As a result, the operation of some SP boilers have been stopped for the repair and maintenance of such ducts to date. These technical accidents resulted in the considerable reduction of emission reductions for this monitoring period.

***<Assessment by the TPE>***

JQA confirmed through the interview with the PPs and the physical observation on-site that the suspension of boiler operation due to the repair and maintenance of some ducts resulted in the considerable reduction of emission reductions for this monitoring period. Thus, CL 01 is closed.

**<Conclusion based on reporting requirements>**

JQA concludes that the monitored data and default values are appropriately and

correctly applied in the calculation of GHG emission reductions achieved by the project activity, in accordance with the applied methodology ID_AM001 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 were identified to the requirement.

**<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>**

Not applicable.

**<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 verification 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 reduction achieved

| Year | Verified Reference Emission (tCO2e) | Verified Project Emission (tCO2e) | Verified Emission Reduction (tCO2e) |
|---|---|---|---|
| 2013 | - | - | - |
| 2014 | - | - | - |
| 2015 | - | - | - |
| 2016 | - | - | - |
| 2017 | - | - | - |
| 2018 | 14,799 | 0 | 14,799 |
| 2019 | - | - | - |
| 2020 | - | - | - |
| Total ($tCO_{2e}$) | | | 14,799 |

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

## E. List of interviewees and documents received

E.1. List of interviewees

1. JFE Engineering
   - Hiroshi Okuda (Manager Sales & Marketing)

2. PT Semen Indonesia
   - Musirah (General Manager)
   - Kokoh Adicaraka (Operational WHPRG)
   - Sholihin (Operational WHPRG)
   - Nugroho Artur (SPV.Operational WHPRG)
   - Veladito Farisi (SPV.Operational WHPRG)
   - Rahmat Tristiyanto (SPV.Operational WHPRG)

- Dany C. Anggoro (SPV.Operational WHPRG)

3. Mitsubishi UFJ Research and Consulting
- Kei Sato (Consultant)

E.2. List of documents received

1. Project Design Document (JCM_ID013_PDD.pdf) _ver.2.0 30/11/2017
2. Monitoring Spreadsheet: Monitoring period: 01/07/2018 - 31/12/2018 (02_JCM_ID_AM001_ver01.0_JFEE_7-12_2018_190207_r1.xlsx)
3. JCM Validation Report (JCM_ID013_Val_Rep.pdf)
4. Modalities of communications statement (JCM_ID013_MoC.pdf)
5. JCM Approved Methodology ID_AM001 (JCM_ID_AM001_ver01.0.pdf)
6. JCM Glossary of Terms (JCM_ID_Glossary_ver02.0)
7. JCM Project Cycle Procedure (JCM_ID_PCP_ver05.0.pdf)
8. JCM Guidelines for Developing Project Design Document and Monitoring Report (JCM_ID_GL_PDD_MR_ver03.0.pdf)
9. JCM Guidelines for Verification and Verification (JCM_ID_GL_VV_ver01.0.pdf)
10. JCM Verification Report Form (JCM_ID_F_Vrf_Rep_ver01.1.docx)
11. Log sheet of Power Generation of WHR system during the monitoring period (01/07/2018-31/12/2018.
12. Documents to demonstrate the installation of four WHR systems at the facility of PT Semen Indonesia (Persero) Tbk. at Tuban cement factory.
13. Design documents of the components of WHR system (4 units of SP boiler, 4 units of AQC boilers, a turbine generator and a cooling tower) (Criterion 2).
14. Process flow diagram of the project WHR systems, showing the use of only waste heat and no use of fossil fuels as a heat source to generate steam for power generation. (Criterion 3)
15. Evidential photos demonstrating no installation of WHR system prior to the implementation of the project activity at the facility of PT Semen Indonesia (Persero) Tbk. at Tuban cement factory. (Criterion 4)
16. Monthly data report of electricity generated by the WHR system and electricity imported from the grid, respectively, during the monitoring period (Criterion 5)
17. Latest power purchase agreement (PPA) between PT Semen Indonesia (Persero) Tbk. and the grid company (Criterion 5)
18. Single line diagram showing the connection of WHR systems only to the internal power grid of PT Semen Indonesia (Persero) Tbk. (Criterion 6)

19. Records, materials and attendee's list of OJT training during the monitoring period
20. Schematic diagram of monitoring structure for this project activity
21. Specification of electricity meter installed at the monitoring point (1)
22. Certificate of the calibration entity accredited by the manufacturer.
23. Technical Note of Power Logic ION8650 electricity meter
24. Work completion report of the JCM project, issued by JFE Engineering Corporation dated 13/07/2018
25. Technical trouble of SP ducts and maintenance schedule

## 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 | - |

# JCM Verification Report Form

## A. Summary of verification

A.1. General Information

| | |
|---|---|
| Title of the project | Power generation by waste heat recovery in the PT Semen Indonesia (Persero) Tbk factory in Tuban |
| Reference number | ID 013 |
| Monitoring period | 01/01/2019 - 31/12/2020 |
| Date of completion of the monitoring report | 19/01/2024 |
| Third-party entity (TPE) | Japan Quality Assurance Organization (TPE-ID-003) |
| Project participant contracting the TPE | JFE Engineering Corporation |
| Date of completion of this report | 11/03/2024 |

A.2 Conclusion of verification

| | |
|---|---|
| Overall verification opinion | ☒ Positive<br>☐ Negative |
| ☒ Unqualified opinion | Based on the process and procedure conducted, JQA provides reasonable assurance that the emission reductions for Power generation by waste heat recovery in the PT Semen Indonesia (Persero) Tbk factory in Tuban<br>✓ Are free of material errors and are a fair representation of the GHG data and information, and<br>✓ 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.)*<br>☐ Qualified Opinion<br>☐ Adverse opinion<br>☐ Disclaimer | <State the reasons> |

A.3. Overview of final verification conclusion

| Item | Verification requirements | No CAR or CL remaining |
|---|---|---|
| The project implementation with the eligibility criteria of the applied methodology | The project implementation 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: [redacted] | Date: 11/03/2024 |

## 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. ☐ | Hiroshi Motokawa | JQA | Internal reviewer | ☒ | Authorized | ☐ |

*Please specify the following for each item.*

* *Function: Indicate the role of the personnel in the verification 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 verification.*

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

C.1. Compliance of the project implementation 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_AM001_ver01.0 "Power Generation by Waste Heat Recovery in Cement Industry" under the scheme of Joint Crediting Mechanism between Republic of Indonesia and Japan.

The project participants (PPs) are PT Semen Indonesia (Persero) Tbk from Republic of Indonesia and JFE Engineering Corporation from Japan.

The purpose of the project is to reduce the consumption of grid electricity at the cement factory by using electricity generated by the waste heat recovery (WHR) system installed at PT Semen Indonesia (Persero) Tbk in Tuban, Indonesia. Four units of WHR system and one unit of steam turbine and generator are installed. One WHR system consists of Suspension Preheater boiler (SP boiler) and Air Quenching Cooler boiler (AQC boiler). Thus, the saving of electricity imported from the grid results in the reduction of $CO_2$ emissions.

The JCM website and Validation Report indicate that the starting date of the project operation is 30/04/2018 and the expected operational lifetime is 9 years. The second monitoring period is between 01/01/2019 and 31/12/2020.

The verification team has assessed through the review of sufficient documents and e-mail interview with the PPs whether physical features of the project are in place and the PPs have operated the project as per eligibility criteria of the applied methodology during the second

monitoring period.

The verification team did not conduct an on-site visit for the second verification as following credible and sufficient information/evidence were obtained from the PPs;

- Specification and information on the project equipment and technology,
- Photos of the project equipment taken during the second monitoring period,
- Monitoring data and its sources on the project operation and monitoring.

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

Criterion 1

*The project utilizes waste heat from the cement production facility by waste heat recovery (WHR) system to generate electricity.*

Through the review of Design of General Arrangement of WHR system at Tuban cement factory and Validation Report, the project information of Criterion 1 in the registered PDD is confirmed as follows:

- Four units of WHR system have been installed at Tuban cement factory. Steam produced by the SP boiler recovering waste heat from suspension preheater and the AQC boiler recovering waste heat from air quenching cooler is supplied to the steam turbine generator.

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

Criterion 2

*WHR system consists of a Suspension Preheater boiler (SP boiler) and/or Air Quenching Cooler boiler (AQC boiler), turbine generator and cooling tower.*

Through the review of Design of General Arrangement and Process Flow Diagram of WHR system at Tuban cement factory, photos of plant construction, Certificate of performance test on WHR project plant and Validation Report, the project information of Criterion 2 in the PDD is confirmed as follows:

- The WHR system installed at Tuban cement factory consists of four units of SP boiler, four units of AQC boiler, one unit of steam turbine and generator with a capacity of 30.6 MW, and cooling tower.
- The WHR process and equipment were designed and supplied by JFE Engineering Corporation.
- Certificate of performance test on WHR project plant dated 27/06/2018 demonstrates that the facility is ready to be operated by PT Semen Indonesia (Persero) Tbk.

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

Criterion 3

*WHR system utilizes only waste heat and does not utilize fossil fuels as a heat source to generate steam for power generation.*

Through the review of Heat Balance Diagram designed by JFE Engineering Corporation and Validation Report, and the interview with PPs, the project information of Criterion 3 in the PDD is confirmed as follows:

- Four units of WHR system utilize only waste heat recovered from preheater tower and clinker cooler, and do not use fossil fuel as a heat source to generate steam for power generation.

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

Criterion 4

*WHR system has not been introduced to a corresponding cement kiln of the project prior to its implementation.*

Through the review of the photos around the kiln before introducing the WHR system and Validation Report, and the interview with PPs, the project information of Criterion 4 in the PDD is confirmed as follows:

- WHR system has not been introduced to a corresponding cement kiln at Tuban cement factory prior to JCM project implementation in February 2015.

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

Criterion 5

*The cement factory where the project is implemented is connected to a grid system and the theoretical maximum electricity output of the WHR system, which is calculated by multiplying maximum electricity output of the WHR system by the maximum hours per year (24 x 365 = 8,760 hours), is not greater than the annual amount of the electricity imported to the cement factory from the grid system:*

- *During the previous year before the validation, if the validation of the project is conducted before the operation of the project, or*
- *During the previous year before the operation of the project, if the validation of the project is conducted after the operation of the project.*

Through the review of the quantity of electricity imported from the regional grid system

in 2017 and Validation Report, the project information of Criterion 5 in the PDD is confirmed as follows:

- The quantity of the electricity imported from the regional grid in 2017 (the previous year of the validation) was 1,217,155 MWh. The net theoretical maximum electricity output of the WHR system is 235,731 MWh (= (30.6-3.69) x 8,760 hr/p), which is much less than the annual amount of electricity imported from the grid. As for the second monitoring period of 01/01/2019-31/12/2020, the net electricity generated by WHR system was 53,569 MWh, which is also much less than 2,124,878 MWh of the electricity imported from the regional grid at Tuban cement factory.

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

Criterion 6

*The WHR system is designed to be connected only to an internal power grid of the cement factory.*

Through the review of the single line diagram of WHR system and the interview with PPs, the project information of Criterion 6 in the PDD is confirmed as follows:

- The WHR system is only connected to the internal power grid of Tuban cement factory.

Hence, it is concluded that the project meets Criterion 6 with a satisfactory result.

**<Findings>**

No issue was identified to the requirement.

**<Conclusion based on reporting requirements>**

The verification team concludes that the project implementation and operation comply with six eligibility criteria of the applied methodology ID_AM001_ver01.0 during the second monitoring period.

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

**<Means of verification>**

The verification team has assessed the project implementation against the registered PDD through the review of the relevant documents and the interview with the PPs. The project is implemented by PT Semen Indonesia (Persero) Tbk from Republic of Indonesia and JFE Engineering Corporation from Japan.

The assessment results are summarized as below.

**[Physical features of the project]**

PT Semen Indonesia (Persero) Tbk has installed WHR system at Tuban cement factory, which utilizes waste heat recovered from preheater tower and clinker cooler and generates steam for power generation. The generated electricity is totally consumed for the plant operation of Tuban cement factory. Therefore, the grid electricity is partly replaced by the electricity from the WHR system, which contributes to the reduction of $CO_2$ emissions from the grid system. The WHR consists of four units of SP boiler, four units of AQC boiler, one unit of steam turbine and generator with a capacity of 30.6 MW, and cooling tower. All facilities have been successfully installed, which complies with the description of the registered PDD.

The verification team therefore confirms that the physical features of the project are in place and the PPs have implemented the project as per the registered PDD.

**[Monitoring points]**

One monitoring parameter described below is measured by electricity meter, in accordance with the monitoring plan.

1. $EG_{SUP,p}$ : The quantity of the electricity supplied from the WHR system to the cement production facility during a given time period *p* [MWh/p]

The electricity meter is located at the control room. The monitored data is transmitted automatically to the server. The daily data of $EG_{SUP,p}$ is also recorded manually by the operator for backup. The number of days during a given time period *p* ($D_p$) for electricity generation is counted once at the end of the second monitoring period.

Thus, it is confirmed through the review of relevant documents and the interview with the PPs that the monitoring point to measure the quantity of electricity generated by the WHR system is in place, in line with the registered PDD.

**[Monitoring structure]**

The monitoring structure has been established. The roles and responsibilities of the personnel are consistent with the description in Monitoring Structure Sheet (MSS). The monitoring activity was successfully conducted according to the monitoring plan.

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 second monitoring period, in line with the monitoring plan of the registered PDD.

**<Findings>**

No issue was identified to the requirement.

**<Conclusion based on reporting requirements>**

The verification team concludes that the project is not changed from the registered PDD and has been implemented and operated in line with the registered PDD during the second monitoring period.

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

**<Means of verification>**

The measuring equipment used for monitoring in the project activity is electricity meter (model: Power Logic™ ION8650, Accuracy class 0.2) made by Schneider Electric. The meter was tested and verified at the factory on 12/08/2015, according to the International Electro-technical Commission (IEC) and American National Standards Institute (ANSI) standards. As per the Verification Procedures of electricity meter prepared by the PP, its accuracy is to be verified every 10 years or at the time of occurrence of abnormality detection. It is therefore confirmed that the accuracy of the meter is appropriately maintained by the PP during the second monitoring period.

It is concluded through the review of relevant documents and the interview with the PPs that the electricity meter is properly managed by the PP in line with the Verification Procedures and the monitoring plan of the registered PDD, and hence does not require the correction of the measured values in the calculation of emission reductions for the second monitoring period.

**<Findings>**

No issue was identified to the requirement.

***<Conclusion based on reporting requirements>***

The verification team concludes that the calibration of the meter is not required during the second monitoring period as per the Verification Procedures of electricity meter and the monitoring plan of the registered PDD. Therefore, the correction of the measured values is not necessary in the calculation of emission reductions for the second monitoring period.

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

**<Means of verification>**

The verification team has assessed the data and calculation of GHG emission reductions

achieved by the project activity as follows:

*(a) A confirmation that appropriate Monitoring Report Sheet of the applied methodology has been used;*

Through the review of the Monitoring Report Sheets (MRS) which are titled as JCM_ID013_MRS_CY2019.xlsx and JCM_ID013_MRS_CY2020.xlsx, it is confirmed that the Monitoring Report Sheets (MRS (input) and MRS (calc_process) of the applied methodology of ID_ AM001_ver01.0 are appropriately used.

*(b) A confirmation that a set of data for the specified monitoring period was complete, or a list of actions taken by the TPE in line with the guidance from the Joint Committee when partial data are unavailable;*

Monitoring Report Sheets provided by the PPs contain a set of monitored data on electricity generated by the WHR system ($EG_{sup,p}$) and the number of days of monitoring period ($D_p$). It is confirmed through the crosscheck with the monitored data (Daily/Monthly monitoring data) that a set of the quantity of electricity and the number of days are complete for the second monitoring period of 01/01/2019 – 31/12/2020.

*(c) A description of how the TPE checked reported data;*

The verification team has reviewed the correctness of the monitored data such as the quantity of electricity ($EG_{sup,p}$) generated by the WHR system and the number of days ($D_p$) of monitoring period given in the MRS for 2019 and 2020. It is confirmed that the quantity of electricity and the number of days in the MRS(input) are fully consistent with those of Daily/Monthly Monitoring Data, as shown in Table 1.

Reference emissions ($RE_p$), project emissions ($PE_p$) and emission reductions ($ER_p$) in the MRS(calc_process) are also correctly calculated.

Table 1 Quantity of electricity generated by the WHR system and the number of days during the second monitoring period of 01/01/2019 – 31/12/2020

| Parameter | Monitored value | Method to check values in the monitoring report with sources |
|---|---|---|
| $EG_{sup,p}$ (MWh/p) | (2019) 41,209<br>(2020) 59,120 | The quantity of electricity in the MRS is cross-checked with Daily/Monthly Monitoring Data of WHR system downloaded from the server. |
| $D_p$ (Days) | (2019) 365<br>(2020) 366 | The number of days of the second monitoring period is counted based on the calendar days. |

*(d) An opinion as to whether assumption, emission factors, default values, and other referenced values that were applied in the calculation have been justified;*

Through the review of the MRS, it is confirmed that the assumptions used in the calculation of emission reductions have been justified. Namely, $CO_2$ emission factor for an Indonesian regional grid system ($EF_{grid}$) and the total maximum rated capacity of equipment of the WHR system which consumes electricity except for the capacity of equipment which uses the electricity generated by itself directly ($EC_{cap}$), which were determined at validation and given in the MPS, have been correctly applied in the calculation of emission reductions.

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 the date format of monitoring period and less emission reductions, the verification team raised CAR 01 and CL 01, and these issues were resolved as explained in "Findings" below.

**<Findings>**

***<CAR 01>***

The PPs are requested to revise the date format of the monitoring period in the cells (B8, B9 and B19) of MRS to the form of dd/mm/yyyy.

***<Resolution by the PPs>***

The date format is corrected from mm/dd/yyyy to dd/mm/yyyy in the revised MRS.

***<Assessment by the TPE>***

The verification team has confirmed that the date format of the monitoring period in the revised MRS is appropriately provided. Thus, CAR 01 is closed.

***< CL 01 >***

The PPs are requested to explain the large difference between the estimated ER (298,126 tCO2) in the MPS and actual one (32,139 tCO2) in the MRS for the second monitoring period. The achievement of ER by the project activity is only 10.7% of the *ex-ante* value.

***<Resolution by the PPs>***

PPs have explained about the cause of considerable decrease in emission reductions for this monitoring period as follows:

"The limited achievement of the ER for the second monitoring period is due mainly to the

unexpected facility failure occurred outside the scope of supply of JCM subsidy. Deformation had occurred on the ducts of No. 1, 2 and 3 SP boilers in 2018 and those boilers could not be operated fully or partly during the monitoring period until the repairs were completed in March 2021, July 2019 and April 2019 respectively. Besides, the lockdown measures for COVID-19 pandemic had caused the reduction in cement production in 2020 from the previous year, which resulted in an unexpected increase of kiln stand-by and caused the decrease in power generation. Hence, ERs were significantly decreased.

**<*Assessment by the TPE*>**

The verification team has confirmed through the review of Report on the Project Status and Performance, and the interview with the PPs, that the suspension of boiler operation due to the repair and maintenance of some ducts resulted in the considerable reduction of emission reductions during the second monitoring period. However, the project activity was implemented in line with the registered PDD. Thus, CL 01 is closed.

**<Conclusion based on reporting requirements>**

The verification team concludes that the monitored data and default values are correctly applied in the calculation of emission reductions achieved during the second monitoring period, in accordance with the applied methodology ID_AM001 and the monitoring plan of the registered PDD.

C.5. Assessment of avoidance of double registration

**<Means of verification>**

The verification team received a written confirmation dated 31/10/2023 which was signed by Alternate authorized signatory of JFE Engineering Corporation and Statement Letter dated 26/10/2023 which was signed by Primary authorized signatory of PT Semen Indonesia (Persero) Tbk. Both statements declare that the registered JCM project is not registered under any international climate mitigation mechanisms other than the JCM. Therefore, the project will not result in double counting of GHG emission reductions.

It is also confirmed through the review of the written confirmation, the check of the relevant website and the interview with PPs that the JCM project is not registered under any international climate mitigation mechanisms other than the JCM.

**<Findings>**

No issue was identified to the requirement.

**<Conclusion based on reporting requirements>**

The verification team concludes that the project is not registered under other international climate mitigation mechanisms.

C.6. Post registration changes

**<Means of verification>**

The verification team received Confirmation Letter dated 31/10/2023 which was signed by Alternate authorized signatory of JFE Engineering Corporation and Statement Letter dated 26/10/2023 which was signed by Primary authorized signatory of PT Semen Indonesia (Persero) Tbk. Both statements state that all project equipment and monitoring plan have not been changed from the registered PDD and the applied methodology during the second monitoring period.

It is confirmed through the review of Confirmation Letter/Statement Letter and the interview with the PP that all project equipment and monitoring plan of the project have not been changed from the registered PDD and the applied methodology during the second monitoring period.

**<Findings>**

No issue was identified to the requirement.

**<Conclusion based on reporting requirements>**

The verification team concludes that the project has not been changed from the registered PDD and the applied methodology.

## D. Assessment of response to remaining issues

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

No FARs were issued in the validation and the previous verification. This is the second verification of the project.

## E. Verified amount of emission reduction achieved

| Year | Verified Reference Emission (tCO2e) | Verified Project Emission (tCO2e) | Verified Emission Reduction (tCO2e) |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 2013 | - | - | - |
| 2014 | - | - | - |
| 2015 | - | - | - |
| 2016 | - | - | - |
| 2017 | - | - | - |
| 2018 | - | - | - |
| 2019 | 8,023 | 0 | 8,023 |
| 2020 | 24,116 | 0 | 24,116 |
| Total ($tCO_{2e}$) | | | 32,139 |

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

## E. List of interviewees and documents received

E.1. List of interviewees

| | | |
|---|---|---|
| - Mr. Hiroshi Okuda | Manager Sale & Marketing | JFE Engineering Corporation |
| - Mr. Suharyanto | GM of Mining & Raw Material | PT Semen Indonesia (Persero) Tbk |
| - Mr. Sholihin | SM of WHRPG & Utility | PT Semen Indonesia (Persero) Tbk |
| - Mr. Mochammad Farid | Section of WHRPG | PT Semen Indonesia (Persero) Tbk |

E.2. List of documents received

1-1. Monitoring Report Sheet, JCM_ID013_MRS_CY2019.xlsx
1-2. Monitoring Report Sheet, JCM_ID013_MRS_CY2020
2-1. Verified Monitoring Report Sheet, JCM_ID013_MRS_CY2019.xlsx
2-2. Verified Monitoring Report Sheet, JCM_ID013_MRS_CY2020.xlsx
3-1. Monthly monitoring data_CY2019.xlsx
3-2. Monthly monitoring data_CY2020.xlsx
4-1. Daily monitoring data_CY2019
4-2. Daily monitoring data_CY2020
5. Project Design Document (JCM_ID013) _ver.2.0, 30/11/2017
6. Monitoring Plan Sheet (JCM_ID013)
7. JCM Validation Report (JCM_ID013), prepared by JQA on 06/03/2018
8. Monitoring Report Sheet for the first monitoring period of 01/07/2018-31/12/2018
9. Verification Report for the first monitoring period, prepared by JQA on 19/03/2019
10. MoC Annex I, submitted on 22/05/2023
11. JCM Approved Methodology ID_AM001 (JCM_ID_AM001_ver01.0.pdf)
12. Monitoring Spreadsheet: JCM_ID_AM001_ver01.0

13. JCM Glossary of Terms (JCM_ID_Glossary_ver02.0)
14. JCM Project Cycle Procedure (JCM_ID_PCP_ver05.0.pdf)
15. JCM Guidelines for Developing Project Design Document and Monitoring Report (JCM_ID_GL_PDD_MR_ver03.0.pdf)
16. JCM Guidelines for Verification and Verification (JCM_ID_GL_VV_ver01.0.pdf)
17. JCM Verification Report Form (JCM_ID_F_Vrf_Rep_ver01.1.docx)
18. General arrangement of WHR project Tuban plant (Criterion 1 & 2)
19. Process flow diagram of WHR project Tuban plant (Criterion 2)

20-1. Photos of plant construction (Criterion 2)

20-2. Certificate of performance test for WHR project Tuban plant, dated 27/06/2018 (Criterion 2)

21. Heat balance diagram of WHR project Tuban plant (Criterion 3)
22. Photos of project site before WHR installation (Criterion 4)
23. Quantity of imported electricity in 2017 before WHR installation (Criterion 5)
24. Single line diagram of WHR system (Criterion 6)
25. Rated capacity (3.69MW) of power consumption of auxiliary equipment
26. Monitoring organization structure since Sep 2020

27-1. Brochure of Watt-Hour meter (Schneider: PowerLogic™ ION8650)

27-2. Photo of PowerLogic™ ION8650

27-3. PowerLogic™ ION8650 Technical Note

27-4. Verification procedures of meter's accuracy prepared by the PP

28-1. Calibration certificate of ION8650, issued by Schneider Electric dated 12/08/2015

28-2. Management procedure of electricity meter, prepared by PT Semen Indonesia group,

29-1. List of major maintenance conducted during 2019-2021

29-2. Status of project activities during 2019-2020

30. Statement Letter on no double registration and PRC, issued by PT Semen Indonesia (Persero) Tbk. on 26/10/2023
31. Declaration of no double registration, issued by JFE Engineering Corp. on 31/10/2023
32. Confirmation Letter on no PRC, issued by JFE Engineering Corp. on 31/10/2023

33-1. Quantity of imported electricity in 2019

33-2. Quantity of imported electricity in 2020

## 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 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: Mr. Hiroshi Motokawa

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 | 2014/12/22 |
| TA 5.1. Chemical industry | - |
| TA 10.1. Fugitive emissions from oil and gas | - |
| TA 13.1. Solid waste and wastewater | 2014/12/22 |
| TA 14.1. Afforestation and reforestation | - |