

## JCM Verification Report Form

### A. Summary of verification

#### A.1. General Information

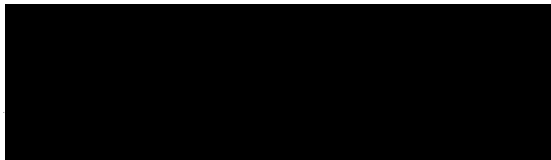
Title of the project	GHG emission reductions through utility facility operation optimization system for refineries in the Republic of Indonesia
Reference number	ID012
Monitoring period	01/01/2018- 31/10/2018
Date of completion of the monitoring report	06/11/2018
Third-party entity (TPE)	Japan Quality Assurance Organization (JQA) (TPE-ID-003)
Project participant contracting the TPE	Azbil Corporation
Date of completion of this report	14/12/2018

#### A.2 Conclusion of verification and level of assurance

Overall verification opinion	<input checked="" type="checkbox"/> Positive <input type="checkbox"/> Negative
<input checked="" type="checkbox"/> Unqualified opinion	<p>Based on the process and procedure conducted, JQA provides reasonable assurance that the emission reductions for GHG emission reductions through utility facility operation optimization system for refineries in the Republic of Indonesia</p> <ul style="list-style-type: none"> <li>✓ Are free of material errors and are a fair representation of the GHG data and information, and</li> <li>✓ Are prepared in line with the related JCM rules, procedure, guidelines, forms and other relevant documents</li> </ul>
<i>(If overall verification opinion is negative, please check below and state its reasons.)</i> <input type="checkbox"/> Qualified Opinion <input type="checkbox"/> Adverse opinion <input type="checkbox"/> 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.	<input checked="" type="checkbox"/>
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.	<input checked="" type="checkbox"/>
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.	<input checked="" type="checkbox"/>
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.	<input checked="" type="checkbox"/>
Avoidance of double registration	The TPE determines whether the project is not registered under other international climate mitigation mechanisms.	<input checked="" type="checkbox"/>
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.	<input checked="" type="checkbox"/>

Authorised signatory:	Mr. <input checked="" type="checkbox"/> Ms. <input type="checkbox"/>
Last name: Asada	First name: Sumio
Title: Senior Executive	
Specimen signature:	Date: 14/12/2018
	

## B. Verification team and other experts

	Name	Company	Function*	Scheme competence*	Technical competence*	On-site visit
Mr. <input checked="" type="checkbox"/> Ms. <input type="checkbox"/>	Tadashi Yoshida	JQA	Team leader	<input checked="" type="checkbox"/>	Authorized	<input type="checkbox"/>
Mr. <input checked="" type="checkbox"/> Ms. <input type="checkbox"/>	Irhan Febijanto	External individual	Team member	<input checked="" type="checkbox"/>	Authorized	<input checked="" type="checkbox"/>
Mr. <input checked="" type="checkbox"/> Ms. <input type="checkbox"/>	Hiroshi Motokawa	JQA	Internal reviewer	<input checked="" type="checkbox"/>	Authorized	<input type="checkbox"/>

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 methodologies ID\_AM007\_ver01.0 "GHG emission reductions through optimization of boiler operation in Indonesia" under the scheme of Joint Crediting Mechanism between Republic of Indonesia and Japan.

The purpose of the project is to reduce CO<sub>2</sub> emission from boiler operation at Pertamina, Refinery Unit IV (hereinafter referred to as RU IV) through the introduction of an operation optimization technology, *i.e.*, RENKEI Control, developed by Azbil Corporation. The target facility consists of ten boilers which supply high pressure steam to eight units of steam turbine and generator. The reduction of CO<sub>2</sub> emissions can be achieved by maximizing the efficiency of boiler operation system through the application of software algorithm using linear programming method and advanced process control.

In the proposed project, approximately 450 - 650 ton/h of high pressure steam has been produced by the operation of ten boilers using fuel oil and fuel gas (off-gas) recovered from the refinery plant. Approximately 80% of the steam is supplied to eight units of steam turbine and generator and the rest of the steam is consumed for the various processes inside the oil refinery. The steam produced is not exported outside the oil refinery and the steam is

not imported from other industrial facilities. Thus, the fuel consumption of the boilers can be saved through the optimization of the boiler operation using RENKEI Control and the annual emission reductions of 20,000 tCO<sub>2</sub>/y would be achieved by the proposed project.

JQA has assessed whether the project implementation and its operation during the monitoring period complies with the eligibility criteria of the applied methodology, through the review of relevant documents, on-site inspection conducted on 23/10/2018 and the interview 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 is implementation of operation optimization of boilers to generate steam, through introduction of Utility Facility Operation Optimization Technology.*

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

- The utility facility operation optimization technology, RENKEI Control, has been applied to the operation of the boilers to maximize the efficiency of boiler operation system at RU IV of Pertamina oil refinery.

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

***Criterion 2***

*The site of introduction is an existing industrial facility which includes two or more boilers to generate steam. .*

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

- The target utility facility consists of the existing 10 boilers which supply high pressure steam to eight units of steam turbine and generator at RU IV of Pertamina's oil refinery.

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

***Criterion 3***

*Historical data for fuel consumption, fuel characteristics (type of fuel, net calorific value)*

*and generation of steam is identifiable for individual boiler for at least one year, as specified in the methodology.*

Through the review of the historical monitored data and the interview with the PPs during the on-site inspection, the project information of Criterion 3 in the PDD is confirmed as follows:

- Historical data on fuel consumption (such as fuel oil and fuel gas) and steam production for each boiler were collected during the 1-year operation of 01/07/2016 - 30/06/2017, prior to the start of the monitoring period, in accordance with the applied methodology ID\_AM007.

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

#### **Criterion 4**

*All steam demand is met internally and not sourced from outside the industrial facility.*

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

- As a result of reviewing the steam balance data between boiler units and steam turbine units during the monitoring period, it is confirmed that the monthly steam production rate was in a range of 443,000 – 455,000 ton and the steam of 359,000 – 361,000 ton was consumed by the steam turbine and generator units. This result shows that about 80 % of the steam produced by the boilers is supplied to steam turbines for power generation and the rest of the steam is consumed as utility in the oil refinery. Furthermore, it is confirmed through the review of steam pipeline diagram that all steam produced by the 10 boilers is supplied to the 8 steam turbine – generator units and various utility lines inside the oil refinery and the additional steam is not provided by the facilities outside the oil refinery. Therefore, all steam demand has been met internally and not sourced from outside the industrial facility during the monitoring period.

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

#### **<Findings>**

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

#### **< CL 06 >**

*Regarding Criterion 4, the PPs are requested to provide steam balance data during the*

*monitoring period.*

**< Resolution of CL 06 by the PPs >**

The monthly data of steam produced by the boilers and the monthly data of steam consumed by the steam turbine and generator units are provided by the PPs. It is confirmed through the review of these monthly data and the steam pipeline diagram that all steam demand was met internally and not sourced from outside the industrial facility during the monitoring period. Thus, CL 06 is closed.

**<Conclusion based on reporting requirements>**

*Please state conclusion based on reporting requirements.*

JQA concludes that the implementation and the operation of the proposed project are in compliance with four eligibility criteria of the applied methodology ID\_AM007 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 project participants of PT Pertamina (Persero) from Republic of Indonesia and Azbil Corporation from Japan.

The assessment results are summarized as follows;

**[Physical features of the project]**

The utility facility operation optimization technology, *i.e.*, RENKEI Control, developed by Azbil Corporation is applied to the boiler operation system to reduce CO<sub>2</sub> emissions from boiler operation through the application of software algorithm using linear programming method and advanced process control. The commissioning of the project equipment was completed on 19/12/2017. The installation of these equipment complies with the description of the registered PDD.

JQA confirms through the on-site inspection 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]**

Four monitoring parameters described below are measured by flow meters, in accordance with the monitoring plan.

1.  $FC_{\text{diesel},p}$  : Consumption of diesel (fuel oil) by the boiler during the period  $p$  [ton/p]
2.  $FC_{\text{LPG},p}$  : Consumption of LPG (fuel gas 1) by the boiler during the period  $p$  [ton/p]
3.  $FC_{\text{gas},p}$  : Consumption of natural gas (fuel gas 2) by the boiler during the period  $p$  [ton/p]
4.  $ST_{p,h}$  : Process steam generation on hour  $h$  during the period  $p$  [tonnes steam/h]

It is confirmed through the on-site inspection and interview with the PPs that the monitoring points for the measurement of fuel oil, fuel gas and steam are located at the right positions of each boiler. The consumption of fuel oil and fuel gas and the production of high pressure steam are monitored hourly and recorded monthly for aggregation. Measured data is automatically transmitted to the server and double-checked by a responsible staff on a monthly basis to prevent the missing of data. Detailed information on the monitoring data of these parameters is described in Section C.4.

**[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 on 1-2/03/2018.

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.

**<Findings>**

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

**< CL 04 >**

*Regarding the operation of the project, the following information is to be provided:*

- 1) *Main reason of shutdown of the project plant operation occurred during the monitoring period (stop of totally 64 hrs),*
- 2) *No operation of B301 boiler during the whole monitoring period.*

**< Resolution of CL 04 by the PPs >**

Following information is provided by the PPs:

- 1) The boilers were running normally during those period. However, the data acquisition system was not able to record the measured data because of the IT network trouble and Gateway issue.

2) B301 boiler was not in operation since 2015 because of the mechanical malfunction. Therefore, the operation data of B301 boiler is not included in the reference data and monitoring data.

It is confirmed through the review of the reference data and monitoring data and the interview with the PPs that 1) no data of the boiler system for 64 h was happened by the trouble of IT network system for data collection and recording, and 2) no operation of B301 boiler does not give any negative effects on the result of historical data collected in 2016-2017 and monitoring data during the monitoring period. Thus, CL 04 is closed.

**<Conclusion based on reporting requirements>**

*Please state 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>**

Some different types of flow meters are used for the measurement of fuel oil, fuel gas and high pressure steam in the project activity, which are manufactured by Azbil Corporation and Emerson.

The flow meters are periodically calibrated during the regular maintenance of boiler, according to the manufacturer's specification under Pertamina Operational Work Procedure (TKO) for calibration (No. B-002/E14184/2018-S9), which complies with the monitoring plan of the registered PDD. The calibration was conducted by Workshop Instrument of Pertamina (LK-136-IND, valid period: 18/02/2015 – 17/02/2019) which is accredited by KAN (National Accreditation Body of Indonesia). It is confirmed through the review of calibration certificates that all flow meters are periodically calibrated without delay, which covers the whole monitoring period. Therefore, no correction of measured values for fuel oil, fuel gas and steam is required in the calculation of emission reductions.

**<Findings>**

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

**< CL 01 >**

*Regarding the calibration of measuring equipment, information on the source for calibration procedure (i.e., API MPMS 14.3 or manufacturer's specification) is not clearly*



*provided in the MRS.*

**< Resolution of CL 01 by the PPs >**

The source of calibration procedure of Pertamina RU IV is manufacture's specification. Pertamina has provided Memorandum on Equipment Calibration Procedures to Azbil Corporation. It is confirmed through the review of relevant documents and the interview with the PPs that the flow meters are calibrated according to the Calibration Procedure (No. C-001/E14181/2016-S9) of the Pertamina RU IV which refers to manufacturer's specification of each equipment, under Pertamina Operational Work Procedure (TKO) for calibration (No. B-002/E14184/2018-S9). Thus, CL 01 is closed.

**< CL 05 >**

*The PPs are requested to provide information on calibration frequency of measuring equipment.*

**< Resolution of CL 05 by the PPs >**

According to Pertamina Operational Work Procedure (TKO) for calibration (B-002/E14184/2018-S9), the calibration of monitoring equipment is conducted at the following cases: 1) Reading data from flow meter is strange, and 2) boiler maintenance (Turnaround, Overhaul). It is confirmed through the review of relevant documents and the interview with the PPs that the flow meters are periodically calibrated during the regular maintenance of boiler, according to Pertamina Operational Work Procedure (TKO) for calibration (No. B-002/E14184 /2018-S9). Thus, CL 05 is closed.

**<Conclusion based on reporting requirements>**

*Please state conclusion based on reporting requirements.*

JQA concludes that the flow meters have been periodically calibrated by a qualified entity, in accordance with the Pertamina Operational Work Procedure (TKO) for calibration. Therefore, no correction of the measured value is required.

**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\_ID\_AM007\_ver01.0\_Azbil\_ID012\_ver2.0\_from Jan to Oct 2018.xlsx, it is confirmed that the Monitoring Report Sheets (MRS(input), MRS(calc\_process)) of applied methodologies ID\_AM007 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) provided by the PPs contains a complete set of the measured data on fuel oil, fuel gas (1 & 2) and steam during the monitoring period of 01/01/2018 - 31/10/2018. It is confirmed through the review of these measured data that the consumption of fuel oil and fuel gas (1 & 2) and the production of process steam are fully provided for the monitoring period, except for the 64 h data missing period due to IT network trouble in the data acquisition system.

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

JQA has reviewed the correctness of measured data given in the MRS for the consumption of fuel oil and fuel gas (1 & 2) and the production of steam through cross-checking them with the logbook data provided by the PPs.

Parameters	Measured values (ton)	Method to check values in the monitoring report with sources
FC <sub>diesel,p</sub>	357,676.0	The value of diesel (fuel oil) in the MRS is cross-checked with logbook data which aggregates the hourly data downloaded from the server.
FC <sub>LPG,p</sub>	22,369.1	The value of LPG (fuel gas 1) in the MRS is cross-checked with logbook data which aggregates the hourly data downloaded from the server.
FC <sub>gas,p</sub>	39,491.0	The value of natural gas (fuel gas 2) in the MRS is cross-checked with logbook data which aggregates the hourly data downloaded from the server.
ST <sub>p,h</sub>	4,556,162.4	The value of process steam in the MRS is cross-checked with logbook data which aggregates the hourly data downloaded from the server.

It is confirmed through the cross-check of the measured data in the MRS with the logbook data that the consumption of diesel (fuel oil), LPG (fuel gas 1) and natural gas (fuel gas 2) and the production of process steam are fully consistent with the sum of their logbook data, and that reference emissions (RE<sub>p</sub>), project emissions (PE<sub>p</sub>) and emission reductions (ER<sub>p</sub>) in the

MRS are correctly calculated.

*(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 calculation 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 values of the parameters  $a$  (= 0.2653 tCO<sub>2</sub>/tonnes-steam) and  $b$  (= 10.146 tCO<sub>2</sub>/h), which are determined by the linear regression analysis based on the 1-year historical data taken during the period of 01/07/2016 – 30/06/2017, are correctly applied in the calculation of reference emissions. Here, hourly based value for the parameter  $b$  is multiplied by 7,232 h, which is the number of hours counted in the 1st monitoring period when steam is generated by the boilers and the amount is recorded properly, in order for the parameter  $b$  to be applicable in the calculation of reference emissions relevant for the 1st monitoring period.

In addition to the parameters  $a$  and  $b$ , it is confirmed that the net calorific value (NCV<sub>diesel</sub>) and CO<sub>2</sub> emission factor (EF<sub>diesel</sub>) of diesel (fuel oil) are derived from the lower default value in Table 1.2 and Table 1.4 of 2006 IPCC, and net calorific values (NCV<sub>LPG</sub> and NCV<sub>gas</sub>) and CO<sub>2</sub> emission factors (EF<sub>LPG</sub> and EF<sub>gas</sub>) of LPG (fuel gas 1) and natural gas (fuel gas 2), which were determined and validated at the time of validation and provided in the MPS, are correctly applied in the calculation of 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.

#### **<Findings>**

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

#### **< CL 02 >**

*Followings are to be explained:*

- 1) *It is not clear why the description on enthalpy is included in "Measurement methods and procedures" of steam monitoring parameter.*
- 2) *It is not clear why the description in "other comments" is removed.*

#### **< Resolution of CL 02 by the PPs >**

PP has submitted revised MRS for TPE's review. It is confirmed through the review of

the revised MRS that the description on enthalpy is appropriately removed from "Measurement methods and procedures" and additional information is added to "other comments". Thus, CL 02 is closed.

**< CL 03 >**

*The PP is requested to clarify the large difference in the emission reductions between ex-ante value (20,000 tCO<sub>2</sub> for 12 months) and ex-post value (34,956 tCO<sub>2</sub> for 10 months).*

**< Resolution of CL 03 by the PPs >**

Following information is provided by the PPs:

At the time of validation the PPs have expected approximately 3% of fuel saving based on the result of Feasibility Study. However, to avoid overestimation of emission reductions by the project, the emission reduction value of 20,000 t/y incorporating a safety factor of 90% confidence level was stated in the registered PDD. (*i.e.* a safety factor of 0.6 was adopted for the project in order to achieve the estimated emission reduction in the PDD at 90% probability.) As such, the ex-ante value of emission reductions in the registered PDD has been inclusive of the safety factor. It is confirmed through the review of relevant documents and the interview with the PPs that the difference in the emission reductions between ex-ante value and ex-post value is largely due to the safety factor applied. Thus, CL 03 is closed.

**<Conclusion based on reporting requirements>**

*Please state 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\_AM007 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>**

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

No issues was identified.

**<Conclusion based on reporting requirements>**

*Please state 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>**

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

No issue was identified.

**<Conclusion based on reporting requirements>**

*Please state 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 Emissions (tCO <sub>2</sub> e)	Reference Emissions (tCO <sub>2</sub> e)	Verified Project Emissions (tCO <sub>2</sub> e)	Verified Emission Reductions (tCO <sub>2</sub> e)
2013				
2014				
2015				
2016				
2017				
2018		1,282,125.8	1,247,168.8	34,956
2019				
2020				
Total (tCO <sub>2</sub> e)				34,956

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

- Michihisa Suzuki, Project Manager for JCM Cilacap, Advanced Solution Dept., Azbil Corporation
- Tohru Sasaki, Lead Engineer, Advanced Solution Dept., Azbil Corporation
- Irawan, Engineer, Azbil Berca Indonesia
- Kustanto Setiyo Utomo, Process Engineer, Pertamina Refinery Unit IV
- Auromi Fitranurkhalq, Process Engineer, Pertamina Refinery Unit IV
- Burhanudin Ardiansyah, Process Engineer, Pertamina Refinery Unit IV
- Ricky R. Anugerah, Energy Conservation & Loss Control (ECLC), Pertamina Refinery Unit IV
- Tyffani Meirnadias, Electrical Instrument & Inspection Engineering, Pertamina Refinery Unit IV
- Chisato Nakade, Senior Consultant, Environmental Strategy Advisory Division, Mitsubishi UFJ Morgan Stanley Securities Co., Ltd.
- Ricky Tagar Risnauli, Senior Consultant, Environmental Strategy Advisory Division, Mitsubishi UFJ Morgan Stanley Securities Co., Ltd.

#### F.2. List of documents received

1. PDD, ver. 02.0 (ID012), 09/02/2018
2. Monitoring Spreadsheet: JCM\_ID\_AM007\_ver01.0 (ID012), 09/02/2018

3. JCM Validation Report (ID012), 02/03/2018
4. Monitoring Spreadsheet: JCM\_ID\_AM007\_ver01.0, Azbil\_ID012\_ver2.0\_ From Jan to Oct 2018, 06/11/2018
5. JCM Modalities of Communication Statement Form (MoC), 10/08/2017
6. JCM Approved Methodology ID\_AM007\_ver01.0, 18/05/2015, JC4, Annex 2
7. JCM Glossary of Terms (JCM\_ID\_Glossary\_ver02.0)
8. JCM Project Cycle Procedure (JCM\_ID\_PCP\_ver05.0)
9. JCM Guidelines for Developing Project Design Document and Monitoring Report (JCM\_ID\_GL\_PDD\_MR\_ver03.0)
10. JCM Guidelines for Validation and Verification (JCM\_ID\_GL\_VV\_ver01.0)
11. JCM Verification Report Form (JCM\_ID\_F\_Vrf\_Rep\_ver01.1)
12. Logbook data on fuel oil and fuel gas consumption and steam production during the monitoring period of 01/01/2018 – 31/10/2018
13. Average operation conditions (production rate, temperature, pressure of steam) of each boiler
14. Historical data of fuel consumption and steam production during the 1-year period of 01/07/2016 - 30/06/2017 and the values of parameters  $a$  and  $b$  determined by a linear regression analysis
15. Hourly data of steam production and consumption measured in February and October 2018
16. Specification of flow meter for fuel oil (Monitoring point No.3)
17. Specification of flow meter for fuel gas 1 (Monitoring point No.4)
18. Specification of flow meter for fuel gas 2 (Monitoring point No.5)
19. Specification of flow meter for process stem (Monitoring point No.6)
- 20-1. Staff training materials for offline tool, 02/08/2017
- 20-2. Staff training materials for operators, 18/09/2017
- 20-3. Staff training materials for operators 2, Dec. 2017
- 20-4. Staff training materials for APC system, 1-2/03/2018
- 20-5. Staff training materials for Load allocation optimization, 1-2/03/2018
- 20-6. Attendee list for staff training conducted on 1-2/03/2018
21. Schematic diagram of monitoring structure
- 22-1. Memorandum regarding Reference of Equipment Calibration for the JCM Project in Pertamina RU IV Cilacap, 07/11/2018
- 22-2. Pertamina Operational Work Procedure (TKO) for calibration (No. B-002/E14184/2018-S9), 08/08/2018
- 22-3. Calibration of DP type electronic flow transmitter in utilities (No. C-001/E14181/2016-S9), 26/08/2016

23. Calibration certificates of flow meters installed at the monitoring points of No. 3-6 during the monitoring period
24. Accreditation Certificate for Workshop of Pertamina RU IV Cilacap issued by KAN, LK-136-IDN, valid period, 18/02/2015 – 17/02/2019
25. Explanation on the large 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



### Statement of competence



Name: Dr. Tadashi Yoshida

Qualified and authorized by Japan Quality Assurance Organization.

Name: Dr. Irhan Febijanto

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

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	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	-

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: 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 4.6. Other manufacturing industries	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	-