JCM Validation Report Form

A. Summary of validation

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	ID 012
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	02/03/2018

A.2 Conclusion of validation

Overall validation opinion	☒ Positive ☐ Negative

A.3. Overview of final validation conclusion

Only when all of the checkboxes are checked, overall validation opinion is positive.

Item	Validation requirements	No CAR or CL remaining
Project design document form	The TPE determines whether the PDD was completed using the latest version of the PDD forms appropriate to the type of project and drafted in line with the Guidelines for Developing the Joint Crediting Mechanism (JCM) Project Design Document, Monitoring Plan and Monitoring Report.	☒
Project description	The description of the proposed JCM project in the PDD is accurate, complete, and provides comprehension of the proposed JCM project.	☒
Application of approved JCM methodology (ies)	The project is eligible for applying applied methodology and that the applied version is valid at the time of submission of the proposed JCM project for validation.	☒
Emission sources and calculation of emission reductions	All relevant GHG emission sources covered in the methodology are addressed for the purpose of calculating project emissions and reference emissions for the proposed JCM project.	☒
	The values for project specific parameters to be fixed *ex ante* listed in the Monitoring Plan Sheet are appropriate, if applicable.	☒
Environmental impact assessment	The project participants conducted an environmental impact assessment, if required by the Republic of Indonesia, in line with Indonesia's procedures.	☒
Local	The project participants have completed a local stakeholder	☒

Item	Validation requirements	No CAR or CL remaining
stakeholder consultation	consultation process and that due steps were taken to engage stakeholders and solicit comments for the proposed project unless a local stakeholder consultation has been conducted under an environmental impact assessment.	
Monitoring	The description of the Monitoring Plan (Monitoring Plan Sheet and Monitoring Structure Sheet) is based on the approved methodology and/or Guidelines for Developing the Joint Crediting Mechanism (JCM) Project Design Document, Monitoring Plan, and Monitoring Report. The monitoring points for measurement are appropriate, as well as whether the types of equipment to be installed are appropriate if necessary.	☒
Public inputs	All inputs on the PDD of the proposed JCM project submitted in line with the Project Cycle Procedure are taken into due account by the project participants.	☒
Modalities of communications	The corporate identity of all project participants and a focal point, as well as the personal identities, including specimen signatures and employment status, of their authorized signatories are included in the MoC.	☒
	The MoC has been correctly completed and duly authorized.	☒
Avoidance of double registration	The proposed JCM project is not registered under other international climate mitigation mechanisms.	☒
Start of operation	The start of the operating date of the proposed JCM project does not predate January 1, 2013.	☒

Authorised signatory:	Mr. ☒	Ms. ☐
Last name: Asada	First name: Sumio	
Title: Senior Executive		
Specimen signature: [redacted]		Date: 02/03/2018

B. Validation team and other experts

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

Please specify the following for each item.

* *Function: Indicate the role of the personnel in the validation activity such as team leader, team member, technical expert, or internal reviewer.*
* *Scheme competence: Check the boxes if the personnel have sufficient knowledge on the JCM.*
* *Technical competence: Indicate if the personnel have sufficient technical competence related to the project under validation.*

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

C.1. Project design document form

<Means of validation>

The PDD form was checked and confirmed as complete in accordance with the JCM Guidelines for Developing Project Design Document and Monitoring Report (JCM_ID_GL_PDD_MR_ver02.1). The latest version of the JCM PDD form (JCM_ID_F_PDD_ver01.1) is used for the PDD of the proposed project (Version 01.0 dated 01/09/2017 for First edition and Version 02.0 dated 09/02/2018 for Second edition). The validation was conducted on the first edition of the PDD.

<Findings>

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

No issue was raised to the requirement.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the PDD is completed using the valid version of the PDD form and drafted in line with the JCM Guidelines for Developing Project Design Document and Monitoring Report.

C.2. Project description

<Means of validation>

The purpose of the proposed project is to achieve GHG emission reductions at an existing oil refinery in Indonesia through the introduction of a utility facility operation optimization technology. The project is implemented at one of the existing refineries of PERTAMINA, Refinery Unit IV (hereinafter referred to as RU IV), located in Cilacap, Central Java, Indonesia. The target utility facility at RU IV consists of ten boilers which supply high pressure steam (hereafter referred to as HP steam) to eight units of steam turbine and generator. The utility facility operation optimization technology, i.e., RENKEI Control, developed by Azbil Corporation is applied to the operation of the boilers in order to maximize the efficiency of boiler operation system through the application of software algorithm using linear programming method and advanced process control. A remote monitoring system to monitor the performance of the system is also installed. As a result, 2 - 5% of the fuel consumption for boiler operation could be saved by the implementation of the proposed project.

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. More than 80% of the high pressure steam is supplied to eight units of steam turbine and generator and the rest of the steam is consumed for the various processes in 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_2/y would be achieved by the proposed project.

The proposed project is implemented by PT Pertamina (Persero) from the Republic of Indonesia and Azbil Corporation from Japan. The commissioning of the project facilities was satisfactorily completed on 19/12/2017 and the starting date of the monitoring activity was set to be 01/01/2018. The expected operational lifetime of the project is 5 years, which is determined by the Memorandum of Understanding (MoU) between New Energy and Industrial Technology Development Organization (hereinafter referred to as NEDO) of Japan and the Directorate General of Oil and Gas, Ministry of Energy and Mineral Resources of the Republic of Indonesia (MIGAS) signed on 07/10/2016.

The proposed project has been selected as one of the JCM demonstration projects by NEDO which is one of the largest national public research and development organizations in Japan. The purpose of NEDO's JCM demonstration project is to demonstrate the effectiveness of advanced clean energy and low-carbon technologies which lead to GHG emission reductions through the introduction of such technologies in the partner country, i.e., Indonesia. The implementation cost of the proposed project is partially financed by the government of Japan through NEDO's JCM demonstration project program. The implementation of the proposed project is expected to promote the dissemination of low-carbon technologies in Indonesia. As

for technology transfer, Azbil Corporation has conducted OJT training on the operation and maintenance of the utility facility operation optimization technology.

JQA has assessed the PDD and the supporting documents through the desk review and on-site assessment conducted on 12/09/2017 to validate the requirements about accuracy and completeness of the project description. The details of the persons interviewed and documents reviewed are provided in Section E of this report.

Regarding the purpose of the proposed project, JQA raised CL 01 and this issue was resolved as explained in "Findings".

<Findings>

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

CL 01

The purpose of the proposed project in A.2 of the PDD is not clearly described.

Resolution of CL 01 by the PPs:

PDD has been revised and the purpose of the JCM project is now clearly stated in A.2 of the revised PDD as follows: The proposed project aims to achieve GHG emission reductions at an existing oil refinery in Indonesia through the introduction of a utility facility operation optimization technology. It is confirmed through the review of the revised PDD and the interview with the PPs that the purpose of the proposed project is clearly described in A.2 of the revised PDD. Thus, CL 01 is closed.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the description of the proposed project in the revised PDD complies with the supporting documents and information obtained through the desk review, on-site visit and the interview with the PPs, and the description is accurate and complete.

C.3. Application of approved methodology(ies)

<Means of validation>

The approved methodology JCM_ID_AM007_ver01.0 "GHG emission reductions through optimization of boiler operation in Indonesia, ver. 1.0" is applied to the proposed project. The methodology is approved by the JC on 18/05/2015 (JC4, Annex 2) and valid at the time of the validation.

JQA has assessed whether the selected methodology is applicable to the proposed project.

The project applicability was checked against four eligibility criteria contained in the approved methodology. The steps taken to validate each eligibility criterion and the conclusion about its applicability to the proposed project are summarized as follows:

Criterion 1:

The project is implementation of operation optimization of boilers to generate steam, through introduction of Utility Facility Operation Optimization Technology.

Justification in the PDD:

One of the utility facility operation optimization technologies, "RENKEI-Control" of Azbil is implemented in the project.

Assessment and conclusion:

It is confirmed through the review of the relevant documents provided by Azbil Corporation, the on-site assessment and the interview with the PPs that the utility facility operation optimization technology, i.e., RENKEI Control, developed by Azbil Corporation is applied to the proposed project to reduce the fuel consumption of ten boilers existed at RU IV of PERTAMINA. Therefore, JQA concludes that the Criterion 1 is satisfied.

Criterion 2:

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

Justification in the PDD:

The target utility facility consists of 10 boilers, which supply high pressure steam to the steam turbine generators.

Assessment and conclusion:

It is confirmed through the review of the relevant documents, on-site inspection and the interview with the PPs that ten boilers have been operated to produce high pressure steam used for electricity generation and process utility at RU IV of PERTAMINA. Therefore, JQA concludes that the Criterion 2 is satisfied.

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.

Justification in the PDD:

Distributed Control System of the target utility facility has a capability of historical data collection at least one year for each utility boiler.

Assessment and conclusion:

It is confirmed through the review of the relevant documents, on-site inspection and the interview with the PPs that the consumption of fuel oil and fuel gas (off-gas) and the production of high pressure steam are continuously monitored with flow meters for each boiler, and Distributed Control System (DCS) of the boiler operation system has a capability of historical data collection from each boiler for at least one year. Therefore, JQA concludes that the Criterion 3 is satisfied.

Criterion 4:

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

Justification in the PDD:

The demand of HP steam generated by boilers is mainly for the steam turbine generators and some is for process unit consumption. All steam demand is met internally and not sourced from outside the industrial facility.

Assessment and conclusion:

It is confirmed through the relevant documents, on-site inspection and the interview with the PPs that approximately 450 - 650 t/h of HP steam is produced by the operation of ten boilers, and 80-85% of the steam is supplied to eight units of steam turbine and generator for electricity generation and the rest of the steam is consumed as utility for various process units at RU IV. All steam demand is met internally and not sourced from outside industrial facility.

Regarding the steam balance between ten boilers and eight steam turbines, JQA raised CL 03 and this issue was resolved as explained in "Findings".

<Findings>

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

CL 03

As for Criterion 4, the steam balance between ten boilers and eight steam turbines is to be provided.

Resolution of CL 03 by the PPs :

During the on-site assessment, relevant data showing the steam balance between ten boilers and eight steam turbines was provided by the PPs for TPE's review. (See Fig. 7.1 on page 26 of "12_FS_report_2008.pdf" in E.2. List of documents received) It is confirmed through the review of the FSR and the monitoring data in August 2017 and the interview with the PPs that the quantity of steam is balanced between the production and consumption sides and all steam demand is met internally and not sourced from outside industrial facility. Thus, CL 03 is closed.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the proposed project is eligible for applying the valid version of the approved methodology ID_AM007_ver01.0 and all eligibility criteria have been met by the proposed project.

C.4. Emission sources and calculation of emission reductions

<Means of validation>

The proposed project aims to achieve GHG emission reductions from the boiler's fuel consumption at an existing oil refinery of RU IV by introducing a utility facility operation optimization technology, i.e., RENKEI Control, developed by Azbil Corporation. The technology selects the optimum boiler's operation condition for producing high pressure steam with the minimum fuel consumption. Both reference emissions and project emissions are sourced from fuel oil and fuel gas (off-gas) consumption by the operation of boiler.

For the calculation of reference emissions, the historical CO_2 emissions of each boiler on hourly basis are first calculated based on the 1-year data of fuel consumption by using the following equation:

$$HE_{j,xh} = \Sigma (FC_{i,j,xh} \times NCV_i \times EF_i) \quad \text{----------} \quad (1)$$

And then, the historical CO_2 emissions of all boiler units on hourly basis are calculated as follows:

$$HE_{xh} = \Sigma HE_{j,xh} \quad \text{----------} \quad (2)$$

Where:

HE_{xh} : Historical CO_2 emissions on hour *h* in the historical 1-year period *x* [tCO_2/h]

$HE_{j,xh}$: Historical CO_2 emissions from boiler *j* on hour *h* in the historical 1-year period *x* [tCO_2/h]

$FC_{i,j,xh}$: Consumption of fossil fuel *i* by the boiler *j* on hour *h* in the historical 1-year period *x* [tCO_2/h]

NCV_i : Net calorific value of fossil fuel type *i* [GJ/mass or volume unit]

EF_i : CO_2 emission factor of fossil fuel type *i* [tCO_2/GJ]

A plot of the steam quantity (ST_{xh}) on the x-axis against CO_2 emissions on the y-axis gives a linearity which is expressed by Equation (3). By repeating a linear regression analysis until the R^2 of the plotted data is larger than 0.49, the parameters *a* and *b* in Equation (3) are determined *ex-ante* based on the historical data.

$HE_{xh} = a \times ST_{xh} + b$ ---------- (3)

Where:

a : Parameter derived as a result of linear regression analysis (Specific emission factor) [tCO_2/tonnes - steam]

b : Parameter derived as a result of linear regression analysis (y-intercept) [tCO_2/h]

Thus, the reference emissions can be calculated from the measured data of steam ($ST_{p,h}$) produced during the monitoring period *p*:

$REp = \sum(a \times ST_{p,h} + b)$ ---------- (4)

Where:

REp : Reference emissions during the period p [tCO_2/p]

$ST_{p,h}$: Process steam generation on hour h during the period p [tonnes-steam/h]

Here, the value of NCV for diesel oil (fuel oil) used in the calculation of historical CO_2 emissions and project emissions is 41.40 GJ/ton, sourced from the lower value of IPCC default values provided in Table 1.2 of Chap.1 Vol.2 of 2006 IPCC Guideline on National GHG Inventories. The value of NCV for fuel gas 1 (LPG) and for fuel gas 2 (natural gas) is 47.93 GJ/ton and 49.40 GJ/ton, respectively, which are determined by the PPs using the data of composition analysis of fuel gas sampled on a periodic basis during the one year from 01/07/2016 until 30/06/2017.

The value of CO_2 emission factor for diesel oil (fuel oil) is 72.60 $kgCO_2$/GJ, sourced from the lower value of IPCC default values provided in Table 1.4 of Chap.1 Vol.2 of 2006 IPCC Guideline. The value of CO_2 emission factor for fuel gas 1 (LPG) and for fuel gas 2 (natural gas) is 60.10 $kgCO_2$/GJ and 55.20 $kgCO_2$/GJ, respectively, which are also determined by the PPs in a same way as NCV.

The values of the parameters *a* and *b* are a=0.2653 tCO_2/tonnes-steam and b=10.146 tCO_2/h (= 88,879 tCO_2/y), respectively, calculated by Equation (3), based on the historical 1-year data taken during the period of 01/07/2016-30/06/2017.

Project emissions are calculated by Equation (5), based on the fuel consumption of boiler.

$PE_p = \Sigma (FC_{i,p} \times NCV_i \times EF_i)$ ---------- (5)

Where:

PE_p : Project emissions during the period *p* [tCO_2/p]

$FC_{i,p}$: Consumption of fossil fuel *i* by the boiler during the period *p* [mass or volume unit]

NCV_i : Net calorific value of fossil fuel *i* [GJ/mass or volume unit]

EF_i : CO_2 emission factor of fossil fuel *i* [tCO_2/GJ]

Thus, the GHG emission reductions during the period *p* are calculated by Equation (6), in line with the approved methodology:

$$ERp = REp - PEp \quad \text{----------} \quad (6)$$

The preliminary values of the monitoring parameters ($FC_{diesel,p}$, $FC_{LPG,p}$, $FC_{gas,p}$ and $ST_{p,h}$) used in the calculation of emission reductions in the MPS are estimated based on the historical data obtained during the 1-year operation from 01/07/2016 until 30/06/2017. Thus, the emission reductions per year are calculated as follows:

$$\begin{aligned} ERp &= REp - PEp \\ &= \sum(a \times ST_{p,h} + b \times 8{,}760 \text{ hr}) - \Sigma (FC_{i,p} \times NCV_i \times EF_i) \\ &= (0.2653 \times 4{,}212{,}414.0 + 10.146 \times 8{,}760) - (345{,}788.2 \times 41.40 \times 72.60 \times 10^{-3} + \\ &\quad 21{,}005.4 \times 47.93 \times 60.10 \times 10^{-3} + 31{,}761.4 \times 49.40 \times 55.20 \times 10^{-3}) \\ &= 1{,}206{,}432.4 - (1{,}039{,}314.8 + 60{,}508.0 + 86{,}609.5) \\ &= 20{,}000.0 \text{ tCO}_2 \end{aligned}$$

The annual GHG emission reductions are estimated to be 20,000 tCO_2 and the sum of the emission reductions for the period of 2018 – 2020 is estimated to be 60,000 tCO_2.

It is confirmed through the review of relevant documents and on-site assessment that all GHG emission sources specified by the applied methodology are identified, and the reference emissions, project emissions and emission reductions in the PDD (ver.02.0) and Monitoring Plan Sheet are correctly calculated, in accordance with the methodology ID_AM007_ver01.0.

<Findings>

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

No issue was raised to the requirement.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA confirms that all emission sources and GHG types specified in the approved methodology are appropriately identified. JQA concludes that the values of parameters to be monitored *ex-post* in the MPS are correctly estimated based on the historical data and the values for the project specific parameters to be fixed *ex-ante* listed in the MPS are correctly determined. In addition, the equations to calculate reference emissions, project emissions and emission reductions for the proposed project are appropriately derived and the emission reductions per year are correctly calculated using parameters and data in the MPS.

C.5. Environmental impact assessment

<Means of validation>

The proposed project is to reduce CO_2 emissions from fuel consumption of boiler through the introduction of a utility facility operation optimization technology. The PDD states that an Environmental Impact Assessment (EIA) is not required, because the proposed project does not conduct a physical development with an impact to the society as well as the environment around the project site. According to the EIA Guidebook for Japanese Companies in Overseas Business Development, published by Institute for Global Environmental Strategies (IGES) on March 2015, there is no stipulation which requires EIA assessment to such kind of the technology implementation. Therefore, JQA confirms that EIA is not required.

<Findings>

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

No issue was raised to the requirement.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the proposed project does not require the EIA. The implementation of the project is in line with the regulations in the Republic of Indonesia and the requirements of the JCM.

C.6. Local stakeholder consultation

<Means of validation>

The PPs conducted a local stakeholder consultation under the EIA at Ciputra Hotel in Semarang City on 18/07/2017. Prior to the meeting, the invitation letter was delivered to the stakeholders on 03/07/2017. For the stakeholders who were not able to attend the meeting, the PPs sent them the presentation materials used in the meeting and requested them to send back their comments, if any. However, the PPs did not receive any comments from them.

The list of the participants for Local Stakeholders' Consultation Meeting is as follows:

- Indonesia JCM Secretariat
- Coordinating Ministry of Economic Affairs (CMEA)
- Department of Industry and Trade (Dinperindag), Central Java Province
- Department of Energy and Mineral Resources (DESDM), Central Java Province
- Department of Environment and Forestry (DLHK), Central Java Province

- Regional Environment Management Board of Central Java Province
- Bureau of Regional Autonomy and Cooperation, PPI Secretariat of Central Java Regional Secretariat
- Department of Manpower and Industry (Disnakerin), Cilacap Regency
- Directorate of Technical and Environment, Directorate General of Oil and Gas, Ministry of Energy and Mineral Resources (MEMR)
- Department of Environment, Cilacap Regency
- Indonesia Petroleum Association (IPA)
- Society of Indonesia Petroleum Engineer
- Society of Indonesia Oil and Gas Production Facility Expert

As there is no residence near the project site where any environmental impact could be caused by the proposed project, the representative of the residents is not included in the participants. The local stakeholders provided positive comments for the proposed project. No negative issues that require actions to be taken by the PPs were raised through the consultation. It is confirmed through the review of the relevant documents and the interview with the PPs that the stakeholder consultation process was appropriately conducted to collect stakeholders' opinions on the project. The summary of the comments received in the consultation and due account of all comments taken by the PPs are fully described in the PDD.

<Findings>

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

No issue was raised to the requirement.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the PPs have completed a local stakeholder consultation process under the EIA and invited comments on the proposed project from the local stakeholders. The summary of the comments received is provided in the PDD in a complete manner and the PPs have taken due account of all the comments received and described this process in the PDD.

C.7. Monitoring

<Means of validation>

The Monitoring Plan consists of the Monitoring Plan Sheet and Monitoring Structure Sheet which comply with the approved Methodology JCM_ID_AM007_ver01.0. Three monitoring parameters, i.e., boiler fuel consumption of diesel ($FC_{diesel,p}$) and gases ($FC_{LPG,p}$ and $FC_{gas,p}$) ,

and process steam generation ($ST_{p,h}$) during the period *p*, are measured by flow meters. The temperature and the pressure of high pressure steam and fuel gas are also measured by bi-metal thermometer and pressure gauge, respectively. The monitoring points of fuel consumption and high pressure steam generation are located at the inlet of boiler and at the outlet of boiler, respectively. The measured data is automatically transmitted to the server in the control room for recording.

The flow rates of fuel and high pressure steam are monitored hourly and recorded monthly for aggregation and the data recorded is double-checked by a responsible staff on a monthly basis to prevent the missing of data. The flow meter and transmitter are periodically calibrated by Workshop Instrument of PT PERTAMINA (PERSERO) (LK-136-IDN, valid period: 18/02/2015 - 17/02/2019) accredited by KAN (National Accreditation Body of Indonesia), in compliance with the internal regulation of PT PERTAMINA (PERSERO). The calibration of flow meter is conducted according to API MPMS 14.3 (Orifice metering of natural gas and other related hydrocarbon fluids-concentric, square-edged Orifice Meters, issued by An American National Standard ANSI/API MPMS Ch. 14.3.1/AGA Report No.3 Part 1).

All monitored data which are required for verification and issuance will be kept and archived electronically for two years after the final issuance of the credits.

The roles and responsibilities of the personnel are described in Monitoring Structure Sheet. The monitoring structure consists of Plant Engineer, Project Engineer and Project Manager. Plant engineer is responsible for data collection and check of monitoring equipment. Project engineer calculates CO_2 emission reductions and prepares an internal report. Project Manager is responsible for project planning, monitoring result and prepares a monitoring report.

It is confirmed through the review of the relevant documents and the interview with the PPs that the monitoring plan complies with the requirements of the approved methodology and the PPs will be able to implement the monitoring activity appropriately according to the monitoring plan.

Regarding the monitoring points, the archiving procedure of data and the enthalpy of high pressure steam, JQA raised CAR 01, CAR 02 and CL 04 and these issues were resolved as explained in "Findings".

<Findings>

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

CAR 01:

The monitoring points for fuel oil at 520B301 and 520B401 boilers are missing in C.2 of

the PDD.

Resolution of CAR 01 by the PPs:

The PDD was revised and the aforementioned two missing monitoring points for fuel oil are now included in the section C.2 of the PDD. It is confirmed through the review of the revised PDD and the interview with the PPs that the monitoring points of 520B301 and 520B401 boilers for fuel oil consumption are correctly included in the figure of the monitoring system. Thus, CAR 01 is closed.

CAR 02:

No description on the archiving procedures of data is included in Monitoring Spreadsheet.

Resolution of CAR 02 by the PPs:

Following statement has been included in the section C.2 of the PDD: "All monitored data which are required for verification/issuance will be kept and archived electronically for two years after the final issuance of the credits." It is confirmed through the review of the revised PDD that the description mentioned-above is newly added in the section C.2 of the PDD and all monitored data is archived electronically for two years after the final issuance of the credits, in accordance with the PDD Guideline (para. 28). Thus, CAR 02 is closed.

CL 04:

It is not clear why the calculation of enthalpy of high pressure steam in MPS is necessary in the proposed project, because the calculation of enthalpy is not requested in the methodology ID_AM007_ver01.0.

Resolution of CL 04 by the PPs:

The statement regarding enthalpy calculation is the original default text in the approved methodology. Because the project does not involve calculation of enthalpy of high pressure steam, relevant section in MPS was revised and description relating enthalpy calculation has been removed to reflect condition of the project correctly. It is confirmed through the revised MPS and the interview with the PPs that the description on the enthalpy calculation is removed, in line with the methodology ID_AM007_ver01.0. Thus, CL 04 is closed.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the description of Monitoring Plan is based on the approved methodology and JCM Guidelines for Developing Project Design Document and Monitoring

Report, and the monitoring points as well as monitoring equipment for measurement are also appropriate. Thus, the PPs have demonstrated feasibility of the monitoring structure and their abilities to implement the monitoring activity appropriately.

C.8. Modalities of Communication

<Means of validation>

The MoC was provided to JQA for review on 23/08/2017, in the valid form (JCM_ID_F_MoC_ver01.0) at the time of validation, in which Azbil Corporation is nominated as the focal point. The MoC was signed by the authorized representatives of PT PERTAMINA (PERSERO) on 04/08/2017 and by the authorized representatives of Azbil Corporation on 08/08/2017, along with the contact details.

JQA has checked the personal identities including specimen signatures and employment status of the authorized signatories directly through the interview with the PPs during on-site assessment. Primary authorized signatory of Azbil Corporation is Mr. Michihisa Suzuki, Manager of Advanced Solution Group, and alternate authorized signatory is Mr. Kazuo Ueki, Senior Consultant. Primary authorized signatory of PT. PERTAMINA (PERSERO) is Mr. Herry Saleh, Advisor II Procces Control Unit, and alternate authorized signatory is Mr. Yulianto Triwibowo, Lead of Process Engineering Unit.

It is confirmed that all corporate and personal details including specimen signatures and the information in the MoC are valid and accurate as requested in the JCM Guidelines for Validation and Verification.

<Findings>

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

No issue was raised to the requirement.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the MoC is completed using the valid version of the form, and the information and the specimen signature of the PPs provided in the MoC are correct and sufficient, in compliance with the requirements of the JCM Guidelines. It is demonstrated that the MoC is correctly completed and dully authorized.

C.9. Avoidance of double registration

<Means of validation>

The representative of focal point entity in the MoC, Mr. Michihisa Suzuki, Manager of Advanced Solution Group of Azbil Corporation, declares that the proposed project is not registered under any other international climate mitigation mechanism other than the JCM. It is confirmed through the check of publicly available information (e.g. UNFCCC website, Markit Environmental Registry, etc.) that the proposed project is not registered under any other international climate mitigation mechanisms in terms of the name of entity, applied technology, scale and location. Thus, it can be concluded that the proposed project will not result in double counting of GHG emission reductions.

<Findings>

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

No issue was raised to the requirement.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the proposed project is not registered under any other international climate mitigation mechanisms and hence will not result in double counting of GHG emission reductions.

C.10. Start of operation

<Means of validation>

For the proposed project, the commissioning of the project facilities was satisfactorily completed on 19/12/2017 and the starting date of monitoring activity is set as 01/01/2018. It is confirmed through the review of relevant documents, on-site assessment and the interview with the PPs that the starting date of the proposed project given in the PDD, 01/01/2018, is correct.

Regarding the starting date of project operation, JQA raised CL 02 and this issue was resolved as explained in “Findings”.

<Findings>

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

CL 02:

The starting date of project operation in A.5 of the PDD is to be confirmed through the validation.

Resolution of CL 02 by the PPs:

The commissioning of the proposed project facilities was satisfactorily completed on 19/12/2017 and hence the PPs have set the starting date of project operation on 01/01/2018. Thus, CL02 is closed.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the starting date of project operation is set as 01/01/2018 and does not predate 01/01/2013 as required by the Guideline of the JCM project.

C.11. Other issues

<Means of validation>

No more issues are raised in the validation of the proposed project.

<Findings>

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

Not applicable.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

Not applicable.

D. Information on public inputs

D.1. Summary of public inputs

In line with the JCM Project Cycle Procedure, the PDD was made publicly available for 30 days from 20/10/2017 to 18/11/2017 to invite public comments on the following JCM website: https://www.jcm.go.jp/id-jp/information/231

No public comments were received.

D.2. Summary of how inputs received have been taken into account by the project participants

Not applicable.

E. List of interviewees and documents received

E.1. List of interviewees

- Michihisa Suzuki, Division Manager, Advanced Solution Dept., Azbil Corporation
- Kazuo Ueki, Senior Consultant, Advanced Solution Dept., Azbil Corporation
- Tohru Sasaki, Engineer of APC Group, Advanced Solution Dept., Azbil Corporation
- M. Suryo Kusumo, Engineer, Azbil Berca Indonesia
- Yulianto Triwibowo, Engineer, Process Engineer Division, Pertamina Refinary Unit IV
- Kustanto Setiyo Utomo, Engineer, Process Engineer Division, Pertamina Refinary Unit IV
- Auromi Fitranurkhaliq, Engineer, Process Engineer Division, Pertamina Refinary Unit IV
- Titok Dalimunthe, Engineer, Energy Conservation & Loss Control (ECLC), Pertamina Refinary Unit IV
- Aryo Wahyu Wicaksono, Engineer, Energy Conservation & Loss Control (ECLC), Pertamina Refinary Unit IV
- Tyffani Meirnadias , Engineer, Electrical Instrument & Inspection Engineering, Pertamina Refinary Unit IV
- Chisato Nakade, Senior Consultant, Clean Energy Finance Division, Mitsubishi UFJ Morgan Stanley Securities Co., Ltd.
- Ricky Tagar Risnauli, Senior Consultant, Clean Energy Finance Division, Mitsubishi UFJ Morgan Stanley Securities Co., Ltd.
- Yusuke Ueno, Chief Officer, Energy Conservation Technology Dept. NEDO
- Masaya Tsuji, Deputy Director, Global Environment Technology Promotion Division, International Affairs Dept., NEDO

E.2. List of documents received

1. PDD, ver. 01.0, 01/09/2017; ver. 02.0, 09/02/2018
2. Monitoring Plan Sheet and Monitoring Structure Sheet, ver. 01.0, 01/09/2017; ver. 02.0, 09/02/2018
3. JCM Modalities of Communication Statement Form (MoC) dated 10/08/2017
4. JCM Approved Methodology ID_AM007_ver01.0, 18/05/2015, JC4, Annex 2
5. JCM Glossary of Terms (JCM_ID_Glossary_ver02.0)
6. JCM Project Cycle Procedure (JCM_ID_PCP_ver05.0)
7. JCM Modalities of Communication Statement Form (JCM_ID_F_MoC_ver01.0)
8. JCM Guidelines for Developing Project Design Document and Monitoring Report (JCM_ID_GL_PDD_MR_ver02.1)
9. JCM Project Design Document Form (JCM_ID_F_PDD_ver01.1)

10. JCM Guidelines for Validation and Verification (JCM_ID_GL_VV_ver01.0)
11. JCM Validation Report Form (JCM_ID_F_Val_Rep_ver01.0)
12. Study Report for Optimal Operation of Utility Facility (Final), Azbil, Yamatake Corporation, PT Yamatake Berca Indonesia, Dec. 2008
13. The Joint Crediting Mechanism (JCM) Implementation in Indonesia, presented by Secretariat JCM Indonesia
14. Simplified RU IV Configuration, provided by the PPs Presentation on-site
15. Overview JCM Location (Boiler Utilities), provided by Pertamina RU IV, 12/09/2017
16. RENKEI Control Guidebook, issued by Japan Electronics Information Technology Industries Association, Jan 2012
17. Concept and application of RENKEI Control for energy use optimization, reported by JEITA, Journal of "KEISO", January 2016
18. Catalogue of Sortia CA1-SOL600P-01
19. Catalogue of UOPT CA1-SOL290-03
20. Outline of Advanced-PS^{TM} System
21. Latest implementation timeline of the proposed project, Azbil Corporation, Oct. 2017
22. MoU between The New Energy and Industrial Technology Development Organization of Japan and The Directorate General of Oil and Gas, Ministry of Energy and Mineral Resources of The Republic of Indonesia, concerning the JCM Demonstration and Verification Project for Utility Facility Operation Optimization Technology "RENKEI Control", signed on 07/10/2016
23. Agreement for Implementation Document for JCM Demonstration and Verification Project, prepared by Azbil Corporation and PT Pertamina (Persero), 19/12/2016
24. Piping and instrument flow of boilers, prepared by Azbil Corporation
25. DCS Control Modification for PT. Pertamina Cilacap Boiler System, Functional Design Document, Doc. No. CN181-15-1-011, July 2017
26. Basic Design of Optimization for PT. Pertamina Cilacap Boiler System, Functional Design Document, Doc. No. CN181-17-1-011, June 2017
27. Hourly data of fuel consumption and steam production measured during the 1-year period of 01/07/2016-30/06/2017 and the result of regression analysis
28. Daily data of steam balance between production and consumption measured during the period of 01/08/2017-31/08/2017
29. List and specification of 10 boilers existed in RU IV
30. List of measuring Instrument used in JCM project
31. Environmental Impact Assessment Guidebook for Japanese Companies in Overseas Business Development, IGES, March 2015
32. Invitation Letter of Local Stakeholder Consultation of the proposed JCM Project,

prepared by Azbil Corporation, 03/07/2017

33. Agenda of Local Stakeholder Consultation for the proposed JCM Project
34. Presentation materials for Local Stakeholders Consultation “Introduction to JCM”, prepared by Mitsubishi UFJ Morgan Stanley Securities, 18/07/2017
35. Presentation materials for Local Stakeholders Consultation “Project Technology”, prepared by Azbil Corporation, 18/07/2017
36. Minutes of Local Stakeholders Consultation for the JCM Project and List of participants
37. Attendance list of Local Stakeholders Consultation
38. Specification of flow meter, Tech Tube Corporation
39. Specification of EL Series Bimetal Thermometers, ASHCROFT
40. Specification of EI Series Bimetal Thermometers, ASHCROFT
41. Accuracy of bimetal thermometer, ASHCROFT
42. Specification of Type 1379 Duragauge Pressure Gauge, ASHCROFT
43. Specification of pressure transmitters (Model STG940/STG960/STG981), Azbil Corporation
44. Analytical data of fuel gas by Pertamina RU IV to calculate NCV_{gas} and EF_{gas}
45. Calibration Test Certificates Workshop Instrument, issued by PT Pertamina
46. Accreditation Certificate for Workshop of Pertamina RU IV Cilacap issued by KAN, LK-136-IDN, valid period, 18/02/2015 – 17/02/2019
47. Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids-Concentric, Square-edged Orifice Meters, American Petroleum Institute(API)/Manual of Petroleum Measurement Standards (MPMS), Chap. 14.3.1, issued by An American National Standard/Report No.3 Part.1
48. Guideline for Electric Transmitter Flow Calibration, issued by PT. PERTAMINA, 05/03/2015
49. Company profile of PT. PERTAMINA (PERSERO)
50. Company profile of Azbil Corporation
51. ENGINEERING DATA BOOK, SI version I, Vol 1, Section 1-15 & 23, issued by Gas Processors Suppliers Association, 2004
52. Calculation tables of NCV and EF for fuel gas 1 and fuel gas 2 based on the measured data
53. Commissioning Completion Certificate, signed by Mr. Hermawan Yudhistiro, Lead of Process Engineering RU IV and Mr. Michihisa Suzuki, Project Manager for JCM Project (RU IV Cilacap Utility), dated 19/12/2017

Annex 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: Mr. Koichiro Tanabe

Qualified and authorized by Japan Quality Assurance Organization.

Function	Date of qualification
Validator	-
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	-
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	-