# JCM Validation Report Form

## A. Summary of validation

A.1. General Information

| | |
|---|---|
| Title of the project | Energy saving by optimum operation at an oil refinery |
| Reference number | ID014 |
| Third-party entity (TPE) | Japan Quality Assurance Organization (TPE-ID-003) |
| Project participant contracting the TPE | Yokogawa Electric Corporation |
| Date of completion of this report | 14/03/2018 |

A.2 Conclusion of validation

| | |
|---|---|
| Overall validation opinion | ☒ Positive<br>☐ 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.<br>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: 14/03/2018 |

## B. Validation team and other experts

| | Name | Company | Function* | Scheme competence* | Technical competence* | On-site visit |
|---|---|---|---|---|---|---|
| Mr. ☒ Ms. ☐ | Koichiro Tanabe | JQA | Team leader | ☒ | Authorized | ☒ |
| Mr. ☒ Ms. ☐ | Irhan Febijanto | External individual | Team member | ☒ | Authorized | ☒ |
| Mr. ☒ Ms. ☐ | Tadashi Yoshida | External individual | 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 was checked and confirmed as complete against the JCM Guidelines for Developing Project Design Document and Monitoring Report (JCM_ID_GL_PDD_MR_ver02.1). A valid form of the JCM PDD Form (JCM_ID_F_PDD_ver01.1) is used for the PDD Version 01.0 dated 28/12/2017 (the first edition) and for the revised PDD Version 02.0 dated 21/02/2018 (the second edition). The validation was completed on the second edition of the PDD.

**<Findings>**

No issues were identified to the requirement.

**<Conclusion based on reporting requirements>**

JQA confirms that the PDD is completed using the valid form of the JCM PDD Form and in accordance with the JCM Guidelines for Developing PDD and MR.

C.2. Project description

**<Means of validation>**

The purpose of the proposed JCM project is to reduce $CO_2$ emissions from oil refinery process by introducing advanced process control system (hereinafter referred to as APC) to the existing oil refinery unit, Refinery Unit V (RU V), in East Kalimantan Province, Indonesia. The APC system enables RU V to optimize its operation for energy saving, including an optimized feed input (or production volume) of hydrogen from HPU and another facilities to the process unit, and to reduce fuels consumed by multiple hydrogen production units (HPUs) and hydro cracking units (HCUs). The annual emission reductions of 1,275 $tCO_2$ will be achieved through the installation of APC in the HPUs and the HCUs.

The validation team conducted one-day on-site assessment of the proposed JCM project on 22/08/2017, after its document review of this proposed JCM project. The on-site assessment including follow-up interview with the following project participants (PPs) was conducted at the project site.

- PT. PERTAMINA (PERSERO), as the owner of RU V and the project participant from Republic of Indonesia side
- Yokogawa Electric Corporation, as the technology/service provider of APC and the project participant from Japan side

The location information and other description in Section A (Project description) of the PDD were cross-checked through the physical inspection. The starting date of project operation is set to be 01/01/2018, as it is the date when commercial operation of the APC has started, and thus, it is reasonable for the starting date of monitoring activities. The expected operational lifetime of the proposed JCM project is defined as five years in the PDD, and it 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 project is partially supported by the government of Japan, through NEDO's financing programme for JCM model projects. As for technology transfer, Yokogawa Electric Corporation has conducted OJT training and provided a manual on operation, maintenance and safety measures of the facilities installed at the project site.

For the scope of the proposed JCM project, both Train A and Train B were included in the initial PDD. However, the project design was changed after the on-site assessment; therefore the validation team raised CL01. This CL was resolved in “Findings” below.

**<Findings>**

**CL01**

It was confirmed through the validation that the PPs eventually decided to remove Train B from the scope of the proposed JCM project. Therefore, it is requested to clarify the reason of its exclusion accordingly.

Resolution by the PPs

This situation was clarified by the PPs as below.

[Exclusion of HCU]

The unexpected-shut-down which RU V experienced after collection of reference data has resulted in degradation of catalyst used in Train B HCU. As a result, the reference parameters based on the linear regression analysis using data collected prior to the shut-down no longer appropriately represent Train B HCU. Considering the time required to collect data for regeneration of reference parameters for Train B, the project decided to exclude Train B HCU from the project.

[Exclusion of HPU]

Although Train B HPU is not affected by the unexpected-shut-down, the project decided to exclude the Train B all together because the project was not able to collect sufficient data leading to the regression coefficient (R^2) of 0.49 or greater for Train B HPU. This condition is required by the applied methodology.

As a result, the validation team considered this PPs' explanation as reasonable, and thus this CL was closed.

**<Conclusion based on reporting requirements>**

In conclusion, the validation team confirms that the description of the proposed JCM project in the PDD is accurate and complete. The issue raised by the validation team was fully clarified.

C.3. Application of approved methodology(ies)

**<Means of validation>**

The project applied the approved methodology JCM_ID_AM006_ver02.0, "GHG emission reductions through optimization of refinery plant operation in Indonesia". The methodology has been approved by the Joint Committee on 04/12/2017 and valid as of

the time of the validation. The validation team assessed whether the selected methodology was applicable to the proposed project. The project applicability was checked against four eligibility criteria stipulated 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 below.

Criterion 1

*The project introduces APC to existing single or multiple hydrogen production units (HPU) and/or hydro cracking unit (HCU) at a refinery plant. APC serves one or more of the following functions:*

| | *Location of installation* | *Location of emission reduction* | *Mechanism of emission reduction* |
|---|---|---|---|
| *A* | *HCU* | *HCU* | *Reduction in heater fuel consumption due to increased reactor column temperature* |
| *B* | *HCU* | *HCU* | *Reduction in reboiler fuel consumption in debutanizers due to reduced variability of column top pressure and lower the pressure* |
| *C* | *HCU* | *HPU* | *Reduction in fuel consumption in HPU due to reduced hydrogen demand in HCU* |
| *D* | *HPU* | *HPU* | *Improved efficiency of hydrogen production in HPU* |

Project information in the PDD:

*The APC introduced to Train A, one of the two production lines at the refinery, RU V, is included in the proposed JCM project. Train A consists of HPU and HCU. The introduced APC will serve function A, C, and D (stipulated in the applied methodology).*

Assessment and conclusion:

A desk review was conducted on the document of RU V plant layout drawing and APC overall system configuration, issued by Yokogawa Electric Corporation. Through the desk review and physically observation at the project site, it was confirmed that the APC had been introduced to the existing Train A of RU V. HPU and HCU, which are main process of Train A, were in operation and the introduced APC was ready to work and monitor for function A, C, and D. Therefore, the validation team concludes that the Criterion 1 is satisfied.

Criterion 2

*The process unit where APC is introduced has been equipped with DCS in operation before the start of project.*

Project information in the PDD:

*The project target process units have been equipped with DCS in operation before the start of the project.*

Assessment and conclusion:

It was confirmed through interview with the project participants and the physical inspection that RU V process has been equipped with DCS in operation before the start of the proposed JCM project. Therefore, the validation team concludes that the Criterion 2 is satisfied.

Criterion 3

*Retrofit and replacement of the process units, cleaning of heat exchangers and/or columns which are performed during a turnaround beyond the regular maintenance activities are not taken place at the process unit where APC is introduced (this criterion is checked upon each instance of verification, and credit will be issued only up to the date of such retrofit). Regular maintenance includes daily inspections and lubrication of rotating equipment, as specified in instruction manual and/or maintenance manual which is defined by users.*

Project information in the PDD:

*A turnaround beyond the regular maintenance activities is not planned to take place at the process unit subject to the project within each monitoring period. In case when such events take place, the relevant project-specific parameters shall be validated by TPE and revised accordingly prior to JCM credit issuance.*

Assessment and conclusion:

A desk review was conducted on the document of RU V's regular maintenance plan in the period of 2014-2020 and the turnaround (T/A) report, issued by PT. PERTAMINA (PERSERO). Through the desk review and the follow-up interview with the project participants, the validation team confirmed that a T/A for HCU and HPU of Train A was conducted during March-April 2017, and the subsequent T/A is planned in 2019. As a

result, the validation team concluded that a T/A is not conducted beyond the planned regular maintenance, and thus the Criterion 3 is satisfied.

Criterion 4

*Feed (or production volume), fossil fuel consumption, and hydrogen consumption at the process unit are acquired, integrated and recorded electrically according to pre-determined time intervals.*

Project information in the PDD:

*The project target process units have been equipped with systems which acquire the data of Feed (or production volume), fossil fuel consumption, and hydrogen consumption, integrate and record them electrically according to pre-determined time intervals.*

Assessment and conclusion:

A desk review was conducted on the document of instrument diagrams of Train A, issued by PT. PERTAMINA (PERSERO). Through the desk review and the physical inspection, it was confirmed that the acquisition, integration and recording for data of feed input, fossil fuel consumption and hydrogen production/consumption were implemented in the control room of RU V properly. In addition, the follow-up interview with operators of RU V ensured that data collection system worked at a certain interval for recording. Therefore the validation team concludes that the Criterion 4 is satisfied.

**<Findings>**

No issues were identified to the requirement.

**<Conclusion based on reporting requirements>**

The validation team confirms that the proposed JCM project applies the valid version of the approved methodology and the applicability is demonstrated to the eligibility criteria of the methodology as appropriate.

C.4. Emission sources and calculation of emission reductions

**<Means of validation>**

The purpose of the proposed JCM project is to reduce $CO_2$ emissions from the

existing oil refinery process (RU V) by introducing advanced process control systems (APC) with aiming at achieving optimum energy efficiency at RU V. The APC equipped with multivariable model predictive control connected to the RU V's existing distributed control system is expected to achieve higher energy efficiency by minimizing variability in key process variables leading to the optimization of production, resulting in a greater energy saving. Both reference emissions and project emissions are sourced from fuel gas consumed by the operation of RU V.

For the calculation of emission reductions, Option A2 (for function A), Option C2 (for function C), and Option D2 (for function D) indicated in Section F.2 of the approved methodology are applied, in other words, data of thirty consecutive operating days taken not more than one year after turnaround is used for calculation of the estimated values of *ex-ante/ex-post* parameters since data for the historical three-year data cannot be obtained.

For the first step of the calculation of reference emissions for function A, it was confirmed that data on hourly feed input in HCU and fossil fuel consumption in HCU heater without installation of APC for a period of thirty consecutive operating days were obtained (the actual period of data monitoring was 21/04/2017 – 12/10/2017). The monitored data was taken not more than one year after turnaround, as the latest turnaround for Train A was conducted during March - April 2017. For the second step, using the hourly data during the period, the PPs derived a linear regression equation through aggregate calculation spreadsheet, titled "Reference parameter definition", defined by the PPs applying the method described in the approved methodology. And for the final step, the parameters were calculated through a calculation spreadsheet, titled "MPS preliminary calculation", by using the results of regression calculation obtained in the former step. For function C and D, the corresponding calculation of reference emissions was applied through the same aggregate calculation spreadsheet in accordance with the approved methodology respectively. As a result, the following parameters were computed appropriately.

Parameters to be monitored *ex post*

| Monitoring point No. | Parameters | Description of data | Estimated Values | Function |
|---|---|---|---|---|
| (1) | $FI_{HCUR,p}$ | Feed input to HCU reactor during the period *p* | 1650909.6 $m^3$ | A, C, and D |
| (3) | $FC_{HCUR,gas,p}$ | Consumption of natural gas during the period *p* in HCU | 15368.3 ton | A |

| | | | | |
|---|---|---|---|---|
| | | reactor heater | | |
| (12) | $FC_{HPU,gas,p}$ | Consumption of natural gas during the period *p* in HPU | 36713.5 ton | C and D |
| (16) | $HP_{HPU,p}$ | Hydrogen production during the period *p* in HPU | 244404000 $Nm^3$ | C and D |
| (17) | $HC_{HCU,p}$ | Hydrogen consumption in HCU during the period *p* | 366964666.8 $Nm^3$ | C and D |

Project-specific parameters to be fixed *ex ante*

| Parameters | Description of data | Estimated Values | Function |
|---|---|---|---|
| *a* | Constant (specific emission factor) obtained by the regression analysis as per step A1-A2 | -1.3000 $GJ/m^3$ | A |
| *b* | Constant (*y*-intercept) obtained by the regression analysis as per step A1-A2 | 2873377.4 GJ | A |
| *e* | Constant (specific energy consumption per hydrogen production) obtained by the regression analysis as per step C1-C2 | 0.003009 $GJ/Nm^3$ | C and D |
| *f* | Constant (*y*-intercept) obtained by the regression analysis as per step C1-C2 | 974910.6 GJ | C and D |
| *g* | Constant (specific hydrogen consumption per fresh feed input) obtained by the regression analysis as per step C1-C3 | 202.26 $Nm^3/m^3$ | C and D |
| *h* | Constant (*y*-intercept) obtained by the regression analysis as per step C1-C3 | 35650682.1 $Nm^3$ | C and D |
| $NCV_{gas}$ | Net calorific value of natural gas | 46.5 GJ/t | A, C, and D |
| $EF_{gas}$ | Emission factor of natural gas | 0.0543 $t\text{-}CO_2/GJ$ | A, C, and D |

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_AM006_ver02.0. As a result, the annual GHG emission reductions are estimated to be 1,275 $tCO_2$ and the sum of the emission reductions for the period of 2018 – 2020 is estimated to be 3,825 $tCO_2$.

For project-specific parameter to be fixed *ex-ante*, the validation team raised CL03. This CL was resolved in "Findings" below.

**<Findings>**

**CL03**

It is described in the MPS that 46.5 GJ/t, which is provided in 2006 IPCC Guidelines as the default net calorific value of natural gas, is applied for $NCV_{gas}$ of the proposed JCM project. In the meantime, it was explained by the project participants that fuel gas consumed by the proposed JCM project includes not only natural gas but also refinery gas. Therefore, it is requested to clarify that it is reasonable to use 46.5 GJ/t for the net calorific value of the project fuel gas.

Resolution by the PPs

It was clarified by the PPs that, according to the laboratory analysis of the fuel gas, the average NCV of the fuel gas at RU V is 48.2 GJ/t which is nearly equivalent to NCV of natural gas (48.0 GJ/t) indicated in 2006 IPCC Guidelines on National GHG Inventories. Of the equations in the applied methodology, it has been confirmed that the smaller NCV values will lead to more conservative estimates, or smaller emission reductions. As such, the default value of NCV for natural gas provided in the applied methodology will result in more conservative estimate of the emission reductions.

Through the clarification by the PPs and additional supplemental documents submitted by the PPs, it is confirmed that the NCV value applied by the proposed JCM project is reasonable and appropriate from a conservativeness standpoint. Therefore, the validation team concludes that this CL can be closed.

**<Conclusion based on reporting requirements>**

The validation team reached the conclusion that the selected emission sources and GHG types were justified for the JCM project. The validation team assessed values for the project-specific parameters to be fixed ex ante, as well as estimated parameters to be monitored ex post, in the MPS and intermediate processes to derive the values. As a result, those were considered reasonable in the context of the proposed JCM project.

| |
|---|
| The issue raised by the team was fully clarified. |

C.5. Environmental impact assessment

**<Means of validation>**

The proposed project is to install Advanced Process Control (APC) system to an existing oil refinery of PT. PERTAMINA (PERSERO), Refinery Unit V (RU V) in East Kalimantan Province, Indonesia, to reduce GHG emissions from energy saving by optimum operation at HPUs and HCUs. The PDD states that an environmental impact assessment (EIA) is not required for development of the proposed JCM project.

It was explained by the PPs that, at the start of its operation of RU V, the environmental permit for operation of the refinery plant has been issued by the Ministry of Environment and Forestry of Indonesia, and EIA has been implemented as a precondition of the permit. It was also confirmed through document review that PT. PERTAMINA (PERSERO), as the state-owned oil-gas company, has received the revised environment permit for operation and development for expanding the refinery plant of RU V as necessary, and the latest version of the environmental permit has been issued by the government in April 2017. Since the scope of this proposed JCM project does not involve any modification/expansion of production facilities and thus no environmental impact is changed, it is not necessary to renew the environmental impact assessment due to the propose JCM project.

**<Findings>**

No issues were identified to the requirement.

**<Conclusion based on reporting requirements>**

The validation team concludes that the project design of the proposed JCM project is in line with the EIA regulation in Indonesia, and no legal requirement of environmental impact assessment is required for the proposed JCM project.

C.6. Local stakeholder consultation

**<Means of validation>**

Through reviewing the initial PDD and the minutes of local stakeholder consultation (LSC) meeting, it was confirmed that a LSC was implemented for the identified local stakeholders, and the following information was confirmed with a satisfactory result.

(a) Comments have been invited from local stakeholders that are relevant for the proposed project.

- The relevant local stakeholders have been identified by the PPs, and a LSC meeting was held near the project site in Balikpapan on 24/05/2017, inviting mainly authorities from central/local government, representative of industries, and local experts in Indonesia.

(b) The summary of the comments received as provided in the PDD is complete.

- The summary of the comments received has been described in the PDD. Through interview with the PPs, it is confirmed that those comments have been described in the PDD appropriately.

(c) The PPs have taken due account of all comments received and have described this process in the PDD.

The validation team determines that the information on the LSC meeting has been described in the PDD appropriately. As a result, it is concluded that no additional actions are required for the comments received.

**<Findings>**

No outstanding issue was raised.

**<Conclusion based on reporting requirements>**

The validation team concluded that the local stakeholder consultation of the proposed JCM project was adequate.

C.7. Monitoring

**<Means of validation>**

Through document review and interviews with the project participants, the following information was confirmed.

(a) Assessment of compliance of the monitoring plan with the approved methodology and/or PDD and Monitoring Guidelines

It was confirmed that the parameters to be monitored *ex-post* were determined in accordance with the applied methodology, and indicated in Monitoring Plan Spreadsheet (MPS) as shown in the former part of this report. For the description of the

monitoring points in the PDD, the validation team raised CAR01. This CAR was resolved in “Findings” below.

(b) Assessment of the implementation of the plan

It was explained confirmed by the PPs the amount of feed input, fuel consumption, and hydrogen production/consumption of the oil refinery process are monitored by measuring equipment individually. In this regard, the validation team raised CL02. This CL was resolved in “Findings” below.

**<Findings>**

**CAR01**

It was confirmed through interview with the project participants that;

1) Monitoring Point No.4 is inactive as fuel oil has not been consumed for HCU reactor for both fresh and recycle feed so far, and there is no future plan to use fuel oil for those facilities under the proposed JCM project; and
2) Two different types of indicators have been installed in Hydrogen feed line between HPU Reformer and HCU Reactor (Monitoring Point No.16 is to monitor hydrogen produced by HPU, and Monitoring Point No.17 is to monitor hydrogen consumed by HCU).

Therefore, regarding the above-mentioned findings, it is requested to describe them in the simplified process flow diagram of Section C.2 of the PDD accordingly.

Resolution by the PPs

It was confirmed that the simplified process flow diagram of Section C.2 of the PDD was revised as below.

1) Monitoring point No.4 has been removed
2) Monitoring point No.16 and No.17 are now indicated separately.

Therefore, the validation team concludes that the revision of the PDD is appropriate, and this CAR is closed.

**CL02**

It is requested to clarify the measurement methods and procedures for measuring equipment, especially flow measuring meters/devices, for monitoring each parameter,

and describe them in Monitoring Plan Sheet accordingly.

Resolution by the PPs

Monitoring Plan Sheets were revised by the PPs to describe measurement methods and procedures for calibration of measuring equipment being described more clearly. Through the revised MPS and additional documents (instrument calibration record of the measuring equipment), it is confirmed that each measuring device (flow meter) is expected to be properly maintained at the time of turnaround. Therefore, the validation team considers it as reasonable for appropriate monitoring activities, and this CL is closed.

**<Conclusion based on reporting requirements>**

The validation team concluded that Monitoring Plan of the proposed JCM project complied with the requirements of the methodology and/or PDD and Monitoring Guidelines, and the project participants have ability to implement the defined Monitoring Plan. It is also confirmed that the Monitoring Structure is feasible as for the means of monitoring. The issues raised by the validation team were fully resolved/clarified, resulting in the revised PDD and the MPS.

C.8. Modalities of Communication

**<Means of validation>**

Through document review, it is confirmed that the signed Modalities of Communication (MoC) have applied the applicable version of MoC form. The validation team also conducted interviews with some of the signatories of the MoC, and then identified the personnel and their employment status, including the specimen signatures. Therefore, the validation team determines that the information of all project participants, including the focal point provided in the MoC and its correctness of authority, is appropriate.

**<Findings>**

No outstanding issue was raised.

**<Conclusion based on reporting requirements>**

The validation team concluded that the MoC complied with all relevant forms and requirements.

C.9. Avoidance of double registration

**<Means of validation>**

It was confirmed through review of the relevant website (e.g. UNFCCC website) that the proposed JCM project has not been registered under other international climate mitigation mechanisms. Also, the written confirmation of the avoidance of double registration was provided through the signed MoC, and was cross-checked through interview with the project participant, with a satisfactory result.

**<Findings>**

No outstanding issue was raised.

**<Conclusion based on reporting requirements>**

The validation team concluded that the proposed JCM project was not registered under the other international climate mitigation mechanisms at the stage of validation.

C.10. Start of operation

**<Means of validation>**

For the proposed JCM project, the commissioning of the project facilities was satisfactorily completed on 31/12/2017, and the starting date of operation, in other words the starting date of monitoring activity, is set as 01/01/2018. Furthermore, it was confirmed that a know-how transfer to the operators and engineers of RU V for operation and maintenance of the APC systems was appropriately implemented by the end of year 2017, according to the APC installation plan. Therefore, it is concluded that the starting date of project operation given in the PDD, 01/01/2018, is appropriate.

**<Findings>**

No outstanding issue was raised.

**<Conclusion based on reporting requirements>**

The validation team concludes that the start of the operating date of the proposed JCM project has been defined appropriately.

C.11. Other issues

**<Means of validation>**

No other issue was identified.

**<Findings>**

No outstanding issue was raised.

**<Conclusion based on reporting requirements>**

Not applicable.

## D. Information on public inputs

D.1. Summary of public inputs

The PDD of the proposed JCM project, which was submitted in line with the Project Cycle Procedure, was made publicly available through the JCM website for public inputs. This call for public comments is open from 12 Jan 2018 - 10 Feb 2018 (24:00 GMT). The specific JCM website of the proposed JCM project is as below, and as a result, no comment was received.

https://www.jcm.go.jp/id-jp/information/251

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

- Wataru Ando, Project Manager, Yokogawa Electric Corporation
- Yoichiro Taguchi, Yokogawa Electric Corporation
- Tatsuhiko Imai, Yokogawa Electric Corporation
- Djatmiko Darmo Saputro, Lead of Process Engineering, Process Engineering, PT. PERTAMINA (PERSERO)
- Yesay Setiawan Sitanggang, Group Leader Process Control and Coordinator JCM-APC, Process Engineering, PT. PERTAMINA (PERSERO)
- Yudhistiro Doddy Sadewo, Junior Process Engineer, Process Engineering, PT.

PERTAMINA (PERSERO)

- Satoshi Nakamura, Senior Consultant, Mitsubishi UFJ Morgan Stanley Securities Co., Ltd.
- Chisato Nakade, Senior Consultant, Mitsubishi UFJ Morgan Stanley Securities Co., Ltd.
- Ricky Tagar Risnauli, Senior Consultant, Mitsubishi UFJ Morgan Stanley Securities Co., Ltd.

E.2. List of documents received

1. Project Design Document for publication (JCM_ID014_PDD_draft.pdf)
2. Monitoring Plan Sheet and Monitoring Structure Sheet for publication (JCM_ID014_MPS_draft.xlsx)
3. Modalities of communications statement, with date of submission for publication (yokogawa_JCM_ID_F_MoC_ver01.0_20170724.pdf)
4. N/A
5. N/A
6. JCM Approved Methodology ID_AM006 (JCM_ID_AM006_ver02.0.pdf)
7. JCM Approved Methodology ID_AM006 (JCM_ID_AM006_ver02.0.xlsx)
8. JCM Glossary of Terms (JCM_ID_Glossary_ver02.0)
9. JCM Project Cycle Procedure (JCM_ID_PCP_ver05.0.pdf)
10. JCM Modalities of Communication Statement Form (JCM_ID_F_MoC_ver01.0.pdf)
11. JCM Guidelines for Developing Project Design Document and Monitoring Report (JCM_ID_GL_PDD_MR_ver02.1.pdf)
12. JCM Project Design Document Form (JCM_ID_F_PDD_ver01.1.docx)
13. JCM Guidelines for Validation and Verification (JCM_ID_GL_VV_ver01.0.pdf)
14. JCM Validation Report Form (JCM_ID_F_Val_Rep_ver01.0.docx)
15. A brochure of APC equipped with multivariable model predictive control (MMPC)
16. MPS preliminary calculation (ver.4)
17. Company profile of PT. PERTAMINA (PERSERO)
18. Company profile of Yokogawa Electric Corporation
19. Memorandum of Understanding concerning the proposed JCM project
20. Process flow diagram of the oil refinery process, including HCU and HPU
21. Propose System Configurations of the JCM Project
22. The documents of RU V's regular maintenance plan in the period of 2014-2020 and the turnaround (T/A) report
23. P&ID on the oil refinery process of the proposed JCM project
24. A list of equipment (HPU Reformer, HCU Reactor, Reactor Charge Heater,

Debutanizer, Debutanizer Reboiler Heater, and Monitoring Points)

25. Guideline for legal requirement of environmental impact assessment in Indonesia
26. Environmental Permit, issued by Ministry of Environment and Forestry of Indonesia (No: SK.176/Menlhk/Setjen/PLA.4/4/2017 and No: SK.177/Menlhk/Setjen/PLA.4/4/2017)
27. The minutes of the local stakeholder consultation meeting, including the invitation letter and the attendees' list
28. Presentation materials for the local stakeholder consultation
29. Specification of the measuring equipment (Monitoring point No.1, 3, 4, 7, 8, 9, 12, 16, 17)
30. Instrument calibration record of the measuring equipment (Monitoring point No.1, 3, 4, 7, 8, 9, 12, 16, 17)
31. Spreadsheet for linear regression analysis (aggregare9AprilMay_rev1.xlsx)
32. Spreadsheet for linear regression analysis (aggregare9JunJly_rev1.xlsx)
33. Spreadsheet for linear regression analysis (aggregare9AugSep_rev1.xlsx)
34. Reference parameter definition (initial version) (baseline11_a2_0906_rev2.xlsx)
35. Project Design Document for request for registration (JCM_ID_F_PDD_ver01.1_YOKOGAWA_APC_ver02.docx)
36. Monitoring Plan Sheet and Monitoring Structure Sheet for request for registration (JCM_ID_AM006_ver02.0_YOKOGAWA_APC_A_A_ver02.xlsx)
37. Monitoring Plan Sheet and Monitoring Structure Sheet for request for registration (JCM_ID_AM006_ver02.0_YOKOGAWA_APC_A_CD_ver02.xlsx)
38. Presentation materials on JCM Project Evaluation Condition
39. Minutes of meeting on JCM project among the PPs on 18/01/2018
40. Calculation results of Net Calorific Value of the fuel oil, which is used for reboiler of Debutanizer
41. Evidential document/data to demonstrate each capacity of the project facilities/equipment
42. Presentation materials of Refinery Unit V profile by PT. PERTAMINA (PERSERO)
43. Estimation of FG fuel density
44. Reference parameter definition (final version) (baseline18_a.xlsx)
45. MPS preliminary calculation (ver.7)
46. Modalities of communications statement, dated 10/01/2018, for registration
47. Meeting materials for exclusion of Train B, dated on 06/03/2018
48. Sensitivity analysis of NCV change in the MPS spreadsheet

# Annex Certificates or curricula vitae of TPE's validation team members, technical experts and internal technical reviewers

***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 | - |

***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: 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 | - |