JCM Project Design Document Form

A. Project description

A.1. Title of the JCM project

Energy saving by optimum operation at an oil refinery

A.2. General description of project and applied technologies and/or measures

The proposed JCM project reduces CO_2 emissions from oil refinery process in Indonesia by introducing advanced process control systems (APC) with the aim of achieving optimum energy efficiency at an existing refinery in the country. The project involves installation of APC to one of the existing refinery unit of PERTAMINA[1], Refinery Unit V (hereafter referred to as RU V), located in Balikpapan, East Kalimantan. RU V consists of multiple hydrogen production units (HPU) and hydro cracking units (HCU), which are equipped with conventional control systems operated by Distributed Control System (DCS). The project, to be implemented by Yokogawa Electric Corporation (YOKOGAWA) of Japan, utilizes the APC equipped with multivariable model predictive control (MMPC). Compared to the conventional control systems at the refinery operated only by DCS, the APC equipped with MMPC connected to the DCS achieves higher energy efficiency by minimizing variability in key process variables leading to the optimization of production, resulting in a greater energy saving. In addition, the training for the operation and maintenance of APC will be provided for local engineers as part of the sustainable technology transfer to the host country. The expected annual emission reduction that would be achieved by the proposed project is 1,275 ton CO_2. The actual emission reduction may vary depending on the rate of operation of the units in the refinery plant.

A.3. Location of project, including coordinates

Country	Republic of Indonesia
Region/State/Province etc.:	East Kalimantan
City/Town/Community etc:	Jl.Yos Sudarso No.1 Balikpapan
Latitude, longitude	S1.26270 E116.81618

[1] A state-owned energy company in Indonesia

A.4. Name of project participants

The Republic of Indonesia	PT. PERTAMINA (PERSERO)
Japan	Yokogawa Electric Corporation

A.5. Duration

Starting date of project operation	01/01/2018
Expected operational lifetime of project	5 years

A.6. Contribution from Japan

The proposed project receives financial support from the government of Japan. The project has been selected as one of the JCM demonstration projects by the New Energy and Industrial Technology Development Organization (NEDO), one of the largest public research and development management organization in Japan. The purpose of NEDO's JCM demonstration projects is to demonstrate the effectiveness of advanced clean energy and low-carbon technologies which leads to GHG emission reductions through the introduction of such technologies in the partner country, i.e. Indonesia. As a result of the support provided by NEDO's program, implementation cost of the proposed JCM project has been financed by Japanese government. Further, implementation of the project promotes transfer of low-carbon technologies in Indonesia. In addition, as a part of NEDO program, know-how transfer to the operators in Indonesia for operation and maintenance of the APC systems has been planned.

B. Application of an approved methodology(ies)

B.1. Selection of methodology(ies)

Selected approved methodology No.	ID_AM006
Version number	Ver2.0

B.2. Explanation of how the project meets eligibility criteria of the approved methodology

Eligibility criteria	Descriptions specified in the methodology	Project information

<table>
<tr><td>Criterion 1</td><td>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:
<table>
<tr><td></td><td>Location of installation</td><td>Location of emission reduction</td><td>Mechanism of emission reduction</td></tr>
<tr><td>A</td><td>HCU</td><td>HCU</td><td>Reduction in heater fuel consumption due to increased reactor column temperature</td></tr>
<tr><td>B</td><td>HCU</td><td>HCU</td><td>Reduction in reboiler fuel consumption in debutanizers due to reduced variability of column top pressure and lower the pressure</td></tr>
<tr><td>C</td><td>HCU</td><td>HPU</td><td>Reduction in fuel consumption in HPU due to reduced hydrogen demand in HCU</td></tr>
<tr><td>D</td><td>HPU</td><td>HPU</td><td>Improved efficiency of hydrogen production in HPU</td></tr>
</table></td><td>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, shown on the left.</td></tr>
<tr><td>Criterion 2</td><td>The process unit where APC is introduced has been equipped with DCS in operation before the start of project.</td><td>The project target process units have been equipped with DCS in operation before the start of the project.</td></tr>
<tr><td>Criterion 3</td><td>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.</td><td>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.</td></tr>
<tr><td>Criterion 4</td><td>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.</td><td>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.</td></tr>
</table>

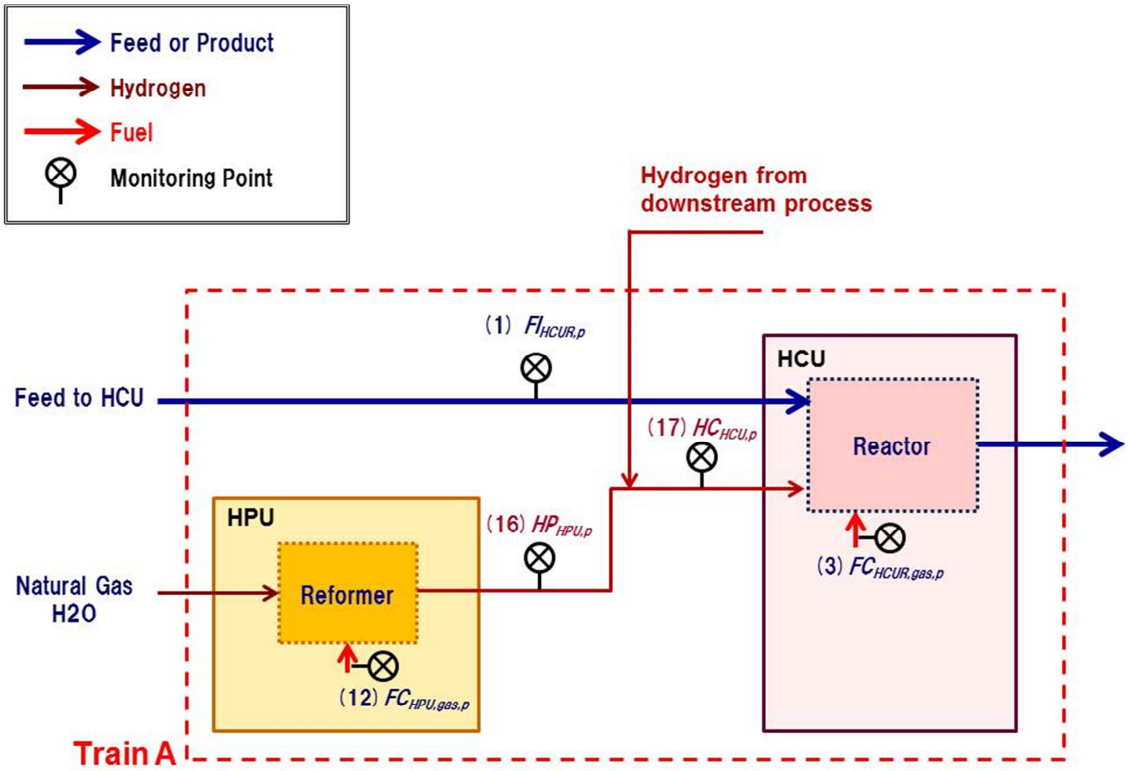
C. Calculation of emission reductions

C.1. All emission sources and their associated greenhouse gases relevant to the JCM project

Reference emissions	
Emission sources	GHG type
Fossil fuel combustion at HPU and HCU	CO2
Project emissions	
Emission sources	GHG type
Fossil fuel combustion at HPU and HCU	CO2

C.2. Figure of all emission sources and monitoring points relevant to the JCM project

The APC introduced to Train A, one of the two production lines at the refinery, RU V, is included in the proposed JCM project. The APC introduced by the project will serve function A, C, and D, as defined in the applied JCM methodology, ID_AM006. The monitoring will be conducted independently for function A and function C&D, and then emission reductions calculated for each function will be aggregated as the total emission reductions for the project. Schematic figures of monitoring points are as shown below:



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.

C.3. Estimated emissions reductions in each year

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2013	-	-	-
2014	-	-	-
2015	-	-	-
2016	-	-	-
2017	-	-	-
2018	245,673.2	244,398.0	1,275
2019	245,673.2	244,398.0	1,275
2020	245,673.2	244,398.0	1,275
Total (tCO_{2e})	737,019	733,194	3,825

D. Environmental impact assessment	
Legal requirement of environmental impact assessment for the proposed project	No

E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

To solicit comments from local stakeholders, a consultation meeting was planned by the project participants, and the project participants invited various stakeholders. Details of the local stakeholders consultation meeting is summarized as follows:

Date and Time: 24 May 2017, 9:00-12:00
Venue: Blue Sky Hotel Balikpapan
Address: Jl. Letjen Suprapto No 1, Balikpapan 76131, Indonesia

Following organization from Indonesia side were invited to the consultation meeting:

- Indonesia JCM Secretariat
- Bureau of Environment (DLH), Balikpapan City
- Bureau of Cooperative, Micro Small Medium Enterprises, and Industry (DKUMKMP),

Balikpapan City
- Regional Environment Management Board (BLH), East Kalimantan Province
- Cooperation Division, Bureau of Border, Territorial Arrangement and Cooperation, East Kalimantan Regional Secretariat
- Department of Industry, Trade and Cooperation, East Kalimantan Province
- Department of Mining and Energy, Government of East Kalimantan Province
- Indonesia Petroleum Association (IPA)
- Society of Indonesia Petroleum Engineer
- Society of Indonesia Oil and Gas Production Facility Expert
- Centre of Management for Kalimantan Ecoregion Development

At the meeting, a brief introduction about JCM scheme/procedures and the status of JCM in Indonesia was first presented. The details of the proposed JCM project and the technology to be introduced were then explained by representative of YOKOGAWA who is in charge of the technical design of the project, followed by a Q and A session. Attendees actively expressed their comments toward the JCM scheme and the proposed JCM project during the meeting. In general, the proposed project was received positively by the attendees to the consultation meeting. No negative comments toward the proposed project were expressed during the stakeholders meeting by the attendees. The comments relevant to the proposed JCM project received during the local stakeholders meeting, along with the responses/action to the comments, are summarized in the following section.

For those who were invited and were unable to attend the local stakeholders' consultation meeting, the project participants sent the presentation materials used in the meeting, requesting them to send their comments, if any. As the result, the project did not receive any comments from those who were invited and were not able to attend the local stakeholders' consultation meeting.

E.2. Summary of comments received and their consideration

Stakeholders	Comments received	Consideration of comments received
Bureau of Environment, Balikpapan City	Is there minimum budget limit to qualify for JCM project?	There is no specific minimum budget to qualify for JCM project. *No further action required.*
	Is there financial support for feasibility study (FS) of a proposed JCM project?	There is some financial support for certain type of JCM project such as large size projects and projects under city-to-city cooperation.

		No further action required.
Bureau of Environment, Balikpapan City	Is there any JCM project that has been done in cooperation between city/regency governments?	Most JCM projects are between private sectors (industries), or private sector and State Owned Companies. However, there is a scheme called City-to-City Cooperation for JCM. Example projects of City-to City Cooperation are cooperation between Surabaya City and Kita-Kyushu, Bandung City and Kawasaki City, and the latest one Batam City and Yokohama city. *No further action required.*
	Balikpapan City is planning to develop its public transportation infrastructure. Can it qualify for JCM ?	Transportation is one of the sectors covered by JCM. Thus, it is possible for Balikpapan city to propose a new JCM project in transportation sector. *No further action required.*
Bureau of Cooperative, Micro Small Medium Enterprises and Industry of Balikpapan City	In the implementation of APC technology in HPU and HCU processes, is there any assessment towards the processed materials? Some of the imported raw materials (crude oil) have higher sulfur content compared to local crude oil, and burden the refinery process.	Implementation of APC does not affect the content and properties of raw material (crude oil) to be used at the refinery. *No further action required.*
	In HCU (Hydro Cracking Unit) / HCC (Hydro Cracking Complex), will the new APC control the debutanizer process, which flare out the unwanted / unrecovered gases, and make the process more efficient?	APC has the same effect for debutanizer; it controls the equipment in the process such that the energy consumption is reduced for the same output. As for the unwanted / unrecovered gas, there is no connection to APC itself. *No further action required.*
Environment Bureau, Government of East Kalimantan	In JCM, what is the role and involvement of the local government? In relation to GHG emission reduction obligation in local government, how can local government access the data / methodology about this project from the secretariat?	Local government is considered as the local stakeholders of the JCM project located in their jurisdiction. The local stakeholders' consultation (LSC) is the JCM procedure to solicit opinions from the social organizations and community around the project site. Local governments are being informed on the progress of project activity at the LSC. In some projects such as projects under city-to-city cooperation, local governments are involved since the beginning of the JCM project. *No further action required.*

F. References

N/A

Reference lists to support descriptions in the PDD, if any.

Annex

Estimated emissions reductions in each year for each function

Function A

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2013	-	-	-
2014	-	-	-
2015	-	-	-
2016	-	-	-
2017	-	-	-
2018	39,484.2	38,804.1	680
2019	39,484.2	38,804.1	680
2020	39,484.2	38,804.1	680
Total (tCO_{2e})	118,452	116,412	2,040

Function C&D

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2013	-	-	-
2014	-	-	-
2015	-	-	-
2016	-	-	-
2017	-	-	-
2018	206, 189.0	205, 593.9	595
2019	206,189.0	205,593.9	595
2020	206,189.0	205,593.9	595
Total (tCO_{2e})	618, 567	616, 782	1,785

Revision history of PDD		
Version	Date	Contents revised
01.0	28/12/2017	First Edition
02.0	21/02/2018	Second Edition