JCM Validation Report Form

A. Summary of validation

A.1. General Information

Title of the project	Introduction of Absorption Chiller to Chemical Factory
Reference number	ID024
Third-party entity (TPE)	Japan Quality Assurance Organization (JQA) (TPE-ID-003)
Project participant contracting the TPE	Tokyo Century Corporation
Date of completion of this report	05/03/2020

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 stakeholder	The project participants have completed a local stakeholder consultation process and that due steps were taken to engage	☒

Item	Validation requirements	No CAR or CL remaining
consultation	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:	Date: 05/03/2020

[redacted]

B. Validation team and other experts

	Name	Company	Function*	Scheme competence*	Technical competence*	On-site visit
Mr. ☒ Ms. ☐	Tadashi Yoshida	JQA	Team Leader	☒	Authorized	☐
Mr. ☒ Ms. ☐	Hiroshi Motokawa	JQA	Internal Reviewer	☒	Authorized	☐

Please specify the following for each item.

* *Function: Indicate the role of the personnel in the 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_ver03.0). The latest version of the JCM PDD form (JCM_ID_F_PDD_ver02.0) is used for the PDD of the proposed project (Version 01.0 dated 09/01/2020 for First edition and Version 01.1 dated 18/02/2020 for Second edition). The validation was conducted on the first edition of the PDD.

<Findings>

No issue was raised to the requirement.

<Conclusion based on reporting requirements>

The validation team 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 reduce GHG emissions from the power consumption of chiller by replacing the existing chiller with project absorption chiller which

generates chilled water used for cooling in the sulfamic acid production process. The steam-driven absorption chiller installed by the proposed project is Type NES-630 with a cooling capacity of 630 USRt, made by Kawasaki Thermal Engineering Co., Ltd. Compared to the reference chiller, energy-saving of up to 96% is expected for the project absorption chiller, and therefore the implementation of the proposed project contributes to the significant GHG emission reductions. The project absorption chiller uses steam as heat source, water as refrigerant and lithium bromide as absorption solution, respectively, and generates chilled water by repeating the cycle of evaporation - absorption - generation - condensation under the coexistence of refrigerant and absorption solution. The steam is generated by recovering waste heat from sulfuric acid production plant and it is supplied to the absorption chiller. As a result, the proposed project would reduce the emission of 712 tCO_2 per year under the most representative cooling capacity conditions and 5,334 tCO_2 in total during the monitoring period of 2019 - 2027.

The proposed project is conducted at the chemical factory located in Karawang Regency, West Java Province, Indonesia, and implemented by PT. Timuraya Tunggal from the Republic of Indonesia and Tokyo Century Corporation from Japan. The commissioning of the project chiller was satisfactorily completed on 24/10/2018, which is confirmed by the Certificate of Completion of Commissioning signed by PT. Timuraya Tunggal and Kawasaki Thermal Engineering Co., Ltd. After installing the project chiller in October 2018, the technical malfunction was found in the monitoring system (EVERY FIT) during the test operation in November 2018 and it took about 4 months to fix the problem. As such the starting date of project operation was forced to postpone until 05/03/2019, which is confirmed by the Report from Kawasaki Thermal Engineering Co., Ltd. dated 10/02/2020 that the use of the monitored data after 05/03/2019 is recommended for the calculation of emission reductions. The expected operational lifetime of the project is 8 years, which is based on the legal durable years for the production facilities of chemical industry issued by Ministry of Finance, Japan.

The proposed project was partially financed by the Ministry of the Environment (MOE), Japan, through the Financing Programme for JCM Model projects, which provides financial support of less than half of the initial investment for the projects in order to acquire JCM credits. As for technology transfer, Tokyo Century Corporation has conducted OJT training on the operation and monitoring of the project absorption chiller system for the engineering staffs of PT. Timuraya Tunggal in October 2018. The annual service has been contracted between PT. Timuraya Tunggal and PT. Gikoko Kogyo Indonesia for the periodical maintenance of the project chiller system.

The validation team has assessed the PDD and the supporting documents through the desk review and the interview with the PPs, without on-site visit, to validate the requirements about accuracy and completeness of the project description. No on-site visit is justified as follows:

The validation of the accuracy and completeness of the project description has been conducted by the document review and interviews. The sufficient evidences and information relevant to the project description have been obtained without on-site visit. The team reviews those documents to determine whether the information in the PDD is accurate and complete, and interviews with the PPs, when necessary the related stakeholders, for understanding the proposed JCM project.

The persons interviewed and documents reviewed are provided in Section E of this report.

Regarding the *address of project site and the outline of project activity*, the validation team raised CAR 01 and CL 01and these issues were resolved as explained in "Findings".

<Findings>

< *CAR 01* >

The address of the project site in A.3 of the PDD is not correctly provided.

< Comments from the PPs >

The address in A.3 of the PDD has been updated in the revised PDD ver01.1.

< Assessment by the TPE >

It is confirmed through the review of the revised PDD that the address of the project site is correctly revised. Thus, CAR 01 is closed.

< *CL 01* >

The PPs are requested to clarify whether the emission reduction is achieved by newly introducing absorption chiller or replacing the existing chiller with absorption chiller in A.2 of the PDD. Furthermore, it is not clearly described why the introduction of absorption chiller contributes to the reduction of GHG emissions.

< Comments from the PPs >

Absorption chiller mainly uses steam to generate chilled water. For this reason, absorption chiller contributes to achieving the emission reduction by significantly reducing the factory's electricity consumption for generating chilled water compared to the existing chiller. Section A.2 of the PDD has been revised.

< Assessment by the TPE >

It is confirmed through the review of the revised PDD and relevant documents and interview with the PPs that the proposed project has replaced the existing chiller with steam-driven absorption chiller (NES-630, made by Kawasaki Thermal Engineering Co., Ltd.) to generate chilled water more efficiently used in the sulfamic acid production process at the chemical factory. Thus, CL 01 is closed.

<Conclusion based on reporting requirements>

The validation team concludes that the description of the proposed project in the revised PDD complies with the supporting documents and information obtained through the desk review 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_AM022_ver01.0 "Introduction of Absorption Chiller" is applied to the proposed project. The methodology is approved by the JC on 31/10/2019 (JC9, Annex 3) and valid at the time of the validation.

The validation team 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 project information for each eligibility criterion and the assessment/conclusion about its applicability to the proposed project are summarized in the following table.

Eligibility criteria	Descriptions specified in the methodology	Project information	Assessment and conclusion
Criterion 1	Project chiller is an absorption chiller with a capacity which is less than or equals to 1,300 USRt. * 1 USRt = 3.52 kW	The proposed project installs a new steam absorption chiller from Kawasaki Thermal Engineering Co., Ltd. (KTE) Type NES-630 with a capacity of 630 USRt	It is confirmed through the review of the relevant documents and the inter-view with the PPs that the absorption chiller (NES-630) with a cooling capacity of 630 USRt less than 1,300 USRt, made by Kawasaki Thermal Engineering Co., Ltd., has been installed and operated to supply chilled water used for cooling in sulfamic acid production process. Hence, Criterion 1 is satisfied.

Criterion 2	Periodical check is planned more than four (4) times annually.	The Indonesian project owner plans to conduct periodical check more than four (4) times a year.	It is confirmed through the review of the relevant documents and the interview with the PPs that Annual Service Contract was made between PT. Timuraya Tunggal and PT. Gikoko Kogyo Indonesia on 24/12/2019 to conduct periodical check 4 times annually. Hence, Criterion 2 is satisfied.
Criterion 3	In the case of replacing the existing chiller with the project chiller, a plan for prevention of releasing refrigerant used in the existing chiller to the air (e.g. re- Execution of this plan is checked at the time of verification, in order to confirm that refrigerant used for the existing one replaced by the project is prevented from being released to the air. In the case that the existing chiller is NOT replaced with the project chiller, this criterion is not applied.	Project chiller uses water as refrigerant. As for the existing chillers, the Indonesian project owner prepared a plan for prevention of refrigerant release to the air from the existing chiller, which has been shared with the Japanese project participant.	It is confirmed through the review of Letter of Consent and the interview with the PPs that Plan for prevention of refrigerant release from existing chiller at PT Timuraya Tunggal dated 28/12/2019 has been prepared by PT. Timuraya Tunggal in accordance with the methodology ID AM022. Hence, Criterion 3 is satisfied.
Criterion 4	In the case that project absorption chiller uses fossil fuel for its heat source, such fossil fuel is gas fuel.	The project absorption chiller is not expected to use fossil fuel for its heat source.	It is confirmed through the review of the relevant documents and the interview with the PPs that the absorption chiller uses steam as heat source. Hence, Criterion 4 is satisfied.

Regarding the MoU in Criterion 3, the validation team raised CL 02 and this issue was resolved as explained in "Findings".

<Findings>

< *CL 02* >

It is not clear why the MoU is provided for Criterion 3 in B.2 of the PDD.

< Comments from the PPs >

The MoU mentioned that the project owner will follow according with laws and regulations of Indonesia. However, the clearer statement has been provided by the project owner for the plan for prevention of refrigerant release to the air from the existing chiller. The answer to Criterion 3 in B.2 of the PDD has been revised.

< Assessment by the TPE >

On 19/06/2019, the PPs prepared the MoU which states that, when selling or disposing of the existing chiller replaced by the property, it shall handle such in accordance with the laws and regulations of Indonesia. After this, PT. Timuraya Tunggal prepared the clearer and detailed Letter of Consent on the handling procedures of refrigerant from the existing chiller, *i.e.*, Plan for prevention of refrigerant release from existing chiller, dated 28/12/2019.

It is confirmed through the review of the MoU and Letter of Consent that Criterion 3 is satisfied with Letter of Consent only, therefore MoU is removed. Thus, CL 02 is closed.

<Conclusion based on reporting requirements>

The validation team concludes that the proposed project is eligible for applying the valid version of the approved methodology ID_AM022 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 reduce CO_2 emissions from the power consumption of chiller by replacing the existing chiller with energy-saving absorption chiller at the chemical factory located in Karawang Regency, Indonesia.

Reference emissions are sourced from the power consumption by reference chiller and project emissions are sourced from the power consumption by project absorption chiller.

Reference emissions are GHG emissions from the use of reference chiller(s), which is determined as centrifugal chiller in this methodology. This value is calculated from cooling energy of project chiller, COP of reference chiller and CO_2 emission factor for consumed electricity, which is expressed by Equation (1), in accordance with the methodology ID_AM022:

$$RE_p = \Sigma (C_{PJ,i,p} / COP_{RE,i} \times EF_{elec}) \quad \text{---------- (1)}$$

Where:

RE_p : Reference emissions during the period *p* (tCO_2/p)

$C_{PJ,i,p}$: Cooling energy generated by project absorption chiller *i* during the period *p* (MWh/p)

$COP_{RE,i}$: COP of reference chiller *i* (-)

EF_{elec} : CO_2 emission factor for consumed electricity (tCO2/MWh)

i : Identification number of the project absorption chiller

Cooling energy generated by project absorption chiller ($C_{PJ,i,p}$) is calculated by Equation (2), in accordance with the JCM ID_AM010_ver01.0:

$$C_{PJ,i,p} = \Sigma \left(\text{water flow rate} \times (T_{outlet} - T_{inlet}) \times C_p \times \rho \times 10^{-3} \times h_{OP,i}\right) \times 0.2778 \quad \text{---------- (2)}$$

Where:

Water flow rate : Quantity of chilled water generated by the project absorption chiller *i* per hour (m^3/h)

T_{inlet} : Inlet temperature of the feed water for chilled water to be generated by the project absorption chiller *i* per hour (℃)

T_{outlet} : Outlet temperature of the chilled water generated by the project absorption chiller *i* per hour (℃)

C_p : Specific heat capacity of water (MJ/tonne-℃]

ρ : Density of water (tonne /m^3)

$h_{OP,i}$: Operating hours of the project absorption chiller (h)

0.2778 : Conversion coefficient from MJ to kWh (kWh/MJ)

The value of $COP_{RE,i}$ is selected from the default COP values provided in the table of the methodology ID_AM022. As the cooling capacity of the project absorption chiller is 630 USRt (Type: NES 630 made by Kawasaki Thermal Engineering Co., Ltd.), the value of COP is determined to be 5.90.

As the grid electricity is consumed by the project absorption chiller, the most recent CO_2 emission factor of Jamali grid (EF_{elec}), 0.877 tCO_2/MWh (ex-post value), is applied in the calculation of reference emissions. The value is sourced from "Emission Factor of Electricity Interconnection Systems (2016)", Indonesia Joint Crediting Mechanism (JCM) website, based on data obtained by Directorate General of Electricity, Ministry of Energy and Mineral Resources, Indonesia. This value is confirmed by the review of "IGES List of Grid Emission Factor" which summarizes the most recently available data up to October 2019 published by host country governments.

It is confirmed through the review of relevant documents and the interview with the PPs

that the project-specific parameters to be fixed *ex-ante* such as $COP_{RE,i}$ and EF_{elec} are correctly applied in the calculation of reference emissions.

Project emissions are GHG emissions from the use of project chiller(s), which are the sum of emissions from electricity consumption and fossil fuel consumption. As the project absorption chiller uses steam generated by waste heat from sulfuric acid production plant, instead of steam generated by firing fossil fuel, the project emissions in the proposed project are calculated from electricity consumption only. The amount of electricity consumption is estimated for the pumps for absorbing solution and refrigerant in the project chiller. The electricity consumed by chilled water pump, cooling water pump and cooling tower is excluded from the amount of electricity consumption since these pumps exist in both reference and project chiller systems. Thus, the project emissions for the proposed project are calculated from the amount of electricity consumed by the pumps for absorbing solution and refrigerant in the project chiller, which is expressed by Equation (3), in accordance with the methodology ID_AM022:

$$PE_p = \Sigma (EC_{PJ,I,p} \times EF_{elec}) + \Sigma (FC_{PJ,I,p} \times NCV_{fuel,i} \times EF_{fuel,i} / 1000)$$

$$= \Sigma (EC_{PJ,I,p} \times EF_{elec}) \quad \text{----------} \quad (3)$$

Where:

PE_p : Project emissions during the period *p* (tCO_2/p)

$EC_{PJ,I,p}$: Electricity consumption by project absorption chiller *i* during the period *p* (MWh/p)

FF_{elec} : CO_2 emission factor for consumed electricity (tCO_2/MWh)

$FC_{PJ,i,p}$: Gas fuel consumption by project absorption chiller *i* during the period *p* (Nm^3/p)

$NCV_{fuel,i}$: Net calorific value of gas fuel consumed by project absorption chiller *i* (MJ/Nm^3)

$EF_{fuel,i}$: CO_2 emission factor for gas fuel consumed by project absorption chiller *i* (tCO_2/GJ)

i : Identification number of project absorption chiller

The value of $EC_{PJ,i,p}$ is calculated by using Method II given in the methodology, *i.e.*, the value is calculated by multiplying the electric power by operating hours of the project chiller. The value of electric power of the project absorption chiller ($EP_{PJ,i}$) is determined to be 7.6 kW based on the manufacturer's specification, which includes power consumption of pumps for absorbing solution and refrigerant in the project chiller.

Thus, the GHG emission reductions during the period *p* are calculated by Equation (4), in line with the approved methodology:

$$ER_p = RE_p – PE_p \quad \text{----------} \quad (4)$$

Where:

ERp : Emission reductions during the period *p* (tCO_2/p)

REp : Reference emissions during the period *p* (tCO_2/p)

PEp : Project emissions during the period *p* (tCO_2/p)

As a result, the annual emission reductions are calculated as follows:

$$ER_p = RE_p – PE_p$$

$$= \Sigma (C_{PJ,i,p} / COP_{RE,i} \times EF_{elec}) - \Sigma (EC_{PJ,I,p} \times EF_{elec})$$

$$= (330 \times 3.52 \times 4{,}290) / 5.90 \times 0.8770) – (7.6 \times 4{,}290/1{,}000) \times 0.8770$$

$$= 712\ tCO_2$$

The GHG annual emission reductions are estimated to be 712 tCO_2 under the most representative cooling capacity condition and the sum of the emission reductions for the period of 2019 – 2027 is estimated to be 5,334 tCO_2.

It is confirmed through the review of relevant documents and the interview with the PPs that all GHG emission sources specified by the applied methodology are identified, and the reference emissions (RE_p), project emissions (PE_p) and emission reductions (ER_p) in the revised PDD (ver01.1) and Monitoring Plan Sheet are correctly calculated, in accordance with the methodology ID_AM022_ver01.0.

Regarding the CO_2 emission source, inconsistency of emission reductions between PDD and MPS, calculation method of $C_{PJ,i,p}$, estimation of $EC_{PJ,i,p}$, CO_2 emission factor of the grid, estimation of annual emission reductions and correctness of $EP_{PJ,i}$ value, the validation team raised CAR 02 – CAR 07 and these issues were resolved as explained in "Findings".

<Findings>

< *CAR 02* >

The source of CO_2 emissions from power consumption of chiller is not clearly described in C.2 of the PDD.

< Comments from the PPs >

The source of CO_2 emissions from power consumption is added to the figure shown in C.2 of the PDD. It is calculated as per Method II stipulated in MPS (input). A note has been

also added on this in C.2.

< Assessment by the TPE >

It is confirmed through the review of the revised PDD that the source of CO_2 emissions from power consumption by the project absorption chiller is appropriately illustrated in the figure of C.2 of the PDD. Thus, CAR 02 is closed.

< *CAR 03* >

The values of reference emissions and emission reductions are not consistent between C.3 of the PDD and MPS (Input_Separate).

< Comments from the PPs >

$C_{PJ,i,p}$ in MPS (Input_Separate) has been revised using the most representative figure within 8 years of the project lifetime, instead of using an average data among the project lifetime. The estimated reference emissions based on the amount of cooling using an average data energy generated by the project absorption chiller for each year are given in C.3 of the PDD.

< Assessment by the TPE >

The emission reductions are calculated by using the most representative cooling capacity of the absorption chiller, *i.e.*, 330 USRt, within 8 years of the project lifetime, instead of using an average cooling capacity for 8 years, *i.e.*, 309.92 USRt. It is confirmed through the review of relevant documents and the interview with the PPs that the emission reductions are correctly calculated to give 712 tCO_2/p under the most representative cooling capacity condition. Thus, CAR 03 is closed.

< *CAR 04* >

The measurement method of $C_{PJ,i,p}$ is not provided in the cell of "(h) Measurement method and procedures" in Table 1 of the MPS. The PPs are requested to provide the formula to calculate the value of $C_{PJ,i,p}$ including monitoring items (such as flow and temperature of chilled water).

< Comments from the PPs >

The formula has been added to the column (*h*) of $C_{PJ,i,p}$.

< Assessment by the TPE >

The formula to calculate cooling energy generated by project absorption chiller is provided in the column (*h*) of the MPS as follows:

$$C_{PJ,i,p} = \Sigma \left(\text{water flow rate} \times (T_{outlet} - T_{inlet}) \times C_p \times \rho \times 10^{-3} \times h_{OP,i}\right) \times 0.2778$$

It is confirmed through the review of the revised MPS that the cooling energy is calculated

based on the measured data of water flow rate, inlet/outlet temperature of chilled water and operating hours of the chiller, and the formula is correct. Thus, CAR 04 is closed.

< *CAR 05* >

The value of $EC_{PJ,i,p}$ is calculated by Method II. The PPs are requested to check the correctness of monitoring option, source of data, monitoring frequency in Table 1 of the MPS and monitoring point (2) in C.2 of the PDD.

< Comments from the PPs >

As monitoring point (2) is calculated using the catalogue value of the electric power of the absorption chiller and monitored operating hours, monitoring point (2) has been removed from C.2 of the PDD.

< Assessment by the TPE >

As Method II is selected for the determination of $EC_{PJ,i,p}$ in the proposed project, the value of $EC_{PJ,i,p}$ is calculated using the catalogue value of the electric power of the absorption chiller (7.6 kW) and monitored operating hours. It is confirmed through the review of the revised MPS that the description in the cells of (f) Monitoring option, (g) Source of data and (i) Monitoring frequency in Table 1 is given for the case of Method I. Thus, CAR 05 is closed.

< *CAR 06* >

As JC Indonesia guides the use of ex-post value for grid emission factor, 0.8770 tCO_2/MWh shall be applied for Jamali grid.

< Comments from the PPs >

The grid emission factor has been revised using JAMALI 2016 ex-post data.

< Assessment by the TPE >

It is confirmed through the review of the revised MPS that the ex-post value of Jamali grid (0.8770 tCO_2/MWh) as CO_2 emission factor for consumed electricity is applied for the calculation of reference /project emissions, which is sourced from “Emission Factor of Electricity Interconnection Systems 2016” Indonesia Joint Crediting Mechanism (JCM) website, based on data obtained by Directorate General of Electricity, Ministry of Energy and Mineral Resources, Indonesia. Thus, CAR 06 is closed.

< *CAR 07* >

The value of $EP_{PJ,i}$ of the project chiller (75 kW) is not consistent with the value given in its specification.

< Comments from the PPs >

Value of $EP_{PJ,i}$ has been revised in the updated MPS (7.6 kW) to be consistent with the

specification.

< Assessment by the TPE >

It is confirmed through the review of the revised MPS (input_separate) and the specification of NES-630 that the value of electric power of the project absorption chiller ($EP_{PJ,i}$) is correctly provided based on its specification. Thus, CAR 07 is closed.

<Conclusion based on reporting requirements>

The validation team confirms that all emission sources and GHG types specified in the approved methodology are appropriately identified. The validation team concludes that the values of parameters to be monitored *ex-post* in the MPS are correctly estimated based on the cooling energy generated by project absorption chiller and operating hours of the project absorption chiller and the values for the project-specific parameters to be fixed *ex-ante* listed in the MPS are also correctly determined. In addition, the equations to calculate reference emissions, project emissions and emission reductions for the proposed project are appropriately derived and the annual emission reductions are correctly calculated using parameters and data in the MPS.

C.5. Environmental impact assessment

<Means of validation>

The purpose of the proposed project is to reduce CO_2 emissions from the power consumption of chiller by replacing reference centrifugal chiller with project absorption chiller. 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 Ministry of Environment decree no 05 year 2012, there is no stipulation which requires EIA assessment to such kind of the technology implementation. Therefore, the validation team confirms that EIA is not required.

<Findings>

No issue was raised to the requirement.

<Conclusion based on reporting requirements>

The validation team 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 Swiss Belinn Karawang Hotel on 14/11/2018. Prior to the meeting, the invitation letter was delivered to the stakeholders on 25/10/2018.

Following public and private entities are identified as stakeholders and they were invited for Local Stakeholders' Consultation Meeting:

- Indonesia JCM Secretariat
- Coordinating Ministry of Economic Affairs (CMEA)
- Environmental and Sanitation Agency (DLHK), Karawang Regency
- Environmental Agency (DLH), West Java Province
- Industrial and Trade Agency (Disperindag), Karawang Regency
- Cooperation Division, Governance and Cooperation Bureau, West Java Province
- Production and Industry Bureau, West Java Province
- Energy and Mineral Resources Agency (DESDM), West Java Province
- Industry and Trade Agency (Disperindag), West Java Province
- American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Indonesia Chapter
- Indonesia Inorganic Basic Chemicals Association (AKIDA)
- PT Century Tokyo Leasing Indonesia
- PT Gikoko Kogyo Indonesia
- Nippon Koei Co., Ltd.
- Takasago Thermal Engineering Co., Ltd.
- Azbil Corporation
- CIMB Niaga
- Mitsubishi Corporation
- PT Monokem Surya
- PT DIC Graphic
- PT Pupuk Kujang
- Other companies
- Jakarta Globe
- NNA Japan Co., Ltd.

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>

No issue was raised to the requirement.

<Conclusion based on reporting requirements>

The validation team 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 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_AM022_ver01.0. The cooling energy generated by the project absorption chiller ($C_{PJ,j,p}$) during the period *p* is calculated based on the measured data of water flow rate, inlet/outlet temperature of the chilled water and operating hours of project absorption chiller ($h_{OP,i,p}$). The parameter of $h_{OP,i,p}$ is counted by EVERY FIT management system.

The monitoring points for cooling energy (1), *i.e.*, measurement of water flow rate and inlet/outlet temperature of chilled water, and operating hours of the absorption chiller (4) are properly located at the right positions of absorption chiller system, respectively, as illustrated by the figure in C.2 of the PDD. The measured data is automatically recorded by EVERY FIT management system.

Two monitoring parameters of $C_{PJ,i,p}$ and $h_{OP,i,p}$ are continuously measured and hourly recorded. The aggregated data is double-checked by a responsible personnel on a monthly basis. The water flow meter (DY150-DALBJ1-0D, made by YOKOGAWA.) and the thermistor (PB3FC-43-S1, made by Shibaura Electronics Co., Ltd.) are replaced or calibrated according to the national regulation or manufacturer's recommendation. The water flow meter installed by the proposed project was tested and certified by Yokogawa Electric Corporation at the time of shipment from the factory on 13/06/2018.

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 JCM Project Manager (Japan), Engineering Manager (Indonesia) and Project Operators (Indonesia). JCM Project Manager prepares monitoring report. In Indonesia, Engineering Manager is in charge of project implementation,

calibration of measuring equipment and monitoring result and Project Operators are responsible for daily recording and checking of monitoring data.

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 are able to implement the monitoring activity appropriately according to the monitoring plan.

Regarding the archiving of data and the monitoring structure, JQA raised CL 03 and CL 04 and these issues were resolved as explained in "Findings".

<Findings>

< *CL 03* >

The description on the archiving of data in the MSS is to be moved to the cell of "(h) Measurement methods and procedures" in the MPS.

< Comments from the PPs >

The description on the archiving of the data in the MSS has been moved to the cell of (h).

< Assessment by the TPE >

It is confirmed through the review of the revised MPS and MSS that the description on the archiving of data in the MSS was moved to the cell of (h) Measurement methods and procedures" in the MPS. Thus, CL 03 is closed.

< *CL 04* >

The role and responsibility of Tokyo Century Corporation and who is responsible for making Monitoring Report are not described explicitly.

< Comments from the PPs >

Tokyo Century Corporation is a "JCM Project Manager" who is in charge of preparing a monitoring report in the MSS. MSS has been revised accordingly.

< Assessment by the TPE >

It is confirmed through the review of the revised MSS and the interview with the PPs that JCM Project Manager (Tokyo Century Corporation) has been newly added who is in charge of preparing monitoring report. Thus, CL 04 is closed.

<Conclusion based on reporting requirements>

The validation team concludes that the description of the MPS and MSS complies with the requirements of applied methodology and JCM Guidelines for Developing Project Design Document and Monitoring Report, and the monitoring points as well as measuring equipment 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 09/01/2020, in the valid form (JCM_ID_F_MoC_ver01.0) at the time of validation, in which Tokyo Century Corporation is nominated as the focal point. The MoC was signed by the authorized representatives of PT. Timuraya Tunggal on 26/12/2019 and by the authorized representatives of Tokyo Century Corporation on 25/12/2019, along with the contact details.

The validation team has checked the personal identities and employment status of the authorized signatories through their business cards. Primary authorized signatory of Tokyo Century Corporation is Deputy General Manager of International Solutions Support Division, and alternate authorized signatory is Manager of the same Division. Primary authorized signatory of PT. Timuraya Tunggal is Director and alternate authorized signatory is Director.

It is confirmed through the check of business cards and the interview with the PPs 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>

No issue was raised to the requirement.

<Conclusion based on reporting requirements>

The validation team 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, Deputy General Manager of International Solutions Support Division of Tokyo Century 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. CDM/JI website, 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.

<Findings>

No issue was raised to the requirement.

<Conclusion based on reporting requirements>

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

C.10. Start of operation

<Means of validation>

For the proposed project, the installation of the project facilities was satisfactorily completed on 24/10/2018 at the project site. However, due to the malfunction of the monitoring system, *i.e.*, EVERY FIT Management system, found in November 2018, the starting date of project operation was forced to postpone until 05/03/2019 after fixing the monitoring system and the completion of test runs. It is confirmed through the review of relevant document and the interview with the PPs that the monitoring activity of the proposed project was actually commenced on 05/03/2019.

<Findings>

No issue was raised to the requirement.

<Conclusion based on reporting requirements>

The validation team concludes that the starting date of project operation, 05/03/2019, is correct 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>

Not applicable.

<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 15/01/2020 to 13/02/2020 to invite public comments on the following JCM website: https://www.jcm.go.jp/id-jp/projects/73

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

- Yasuhiko Sakuta	Manager, International Solutions Support Division, Tokyo Century Corporation
- Ricky Tagar Risnauli	Senior Consultant, Mitsubishi UFJ Morgan Stanley Securities Co., Ltd.
- Yukimi Shimura	Senior Consultant, Mitsubishi UFJ Morgan Stanley Securities Co., Ltd.

E.2. List of documents received

1. PDD, ver. 01.0, 09/01/2020 and ver. 01.1, 18/02/2020
2. Monitoring Plan Sheet and Monitoring Structure Sheet, ver. 01.0, 09/01/2020, ver. 01.1, 18/02/2020
3. JCM Modalities of Communication Statement Form (MoC) submitted for JC, dated 08/01/2020
4. Business cards of Primary authorised signatory, Alternate authorised signatory from Japanese and Thailand sides along with Contact person
5. JCM Approved Methodology (ID_AM022_ver01.0, 31/10/2019 (JC9, Annex 3))
6. Monitoring Spreadsheet (ID_AM022_ver01.0)
7. JCM Modalities of Communication Statement Form (JCM_ID_F_MoC_ver01.0)
8. JCM Glossary of Terms (JCM_ID_Glossary_ver02.0)
9. JCM Project Cycle Procedure (JCM_ID_PCP_ver05.0)

10. JCM Project Design Document Form (JCM_ID_F_PDD_ver02.0)
11. JCM Guidelines for Developing Project Design Document and Monitoring Report (JCM_ID_GL_PDD_MR_ver03.0)
12. JCM Validation Report Form (JCM_ID_F_Val_Rep_ver01.0)
13. JCM Guidelines for Validation and Verification (JCM_ID_GL_VV_ver01.0)
14-1. Layout diagram of steam-driven absorption chiller system installed at the chemical factory
14-2. Electric wiring diagram of steam-driven absorption chiller system
15. Certificate of Completion of Commissioning issued by Kawasaki Thermal Engineering Co., Ltd., dated 24/10/2018
16. Company profile of PT. Timuraya Tunggal
17. Company profile of Tokyo Century Corporation
18. Letter from Kawasaki Thermal Engineering Co., Ltd. dated 10/02/2020 which reports the trouble-shooting of the monitoring system and the starting date of monitoring on 05/03/2019
19. Legal durable year list issued by Ministry of Finance, Japan, to demonstrate the expected operational lifetime (8 years) of the chemical industry facilities
20. Contract of the proposed project between Tokyo Century Corporation and Global Environment Centre Foundation (GEC) dated 02/04/2018
21-1. Records of the staff training for operation and monitoring of the absorption chiller system conducted on 24/10/2018, using Instruction Manual
21-2. Photo after training
22. Instruction Manual of Kawasaki Double-Effect Absorption Chiller Efficio Series, including Operation and Maintenance Procedures, issued by Kawasaki Thermal Engineering Co., Ltd.
23. Catalogue and specification of absorption chiller Efficio series, Type NES-630, issued by Kawasaki Thermal Engineering Co., Ltd.
24-1. Plan for prevention of refrigerant release from existing chiller at PT. Timuraya Tunggal, dated 28/12/2019
24-2. MoU among PT. Timuraya Tunggal, Tokyo Century Corporation and PT. Century Tokyo Leasing Indonesia, dated 19/06/2019
25. Annual Service Contract for Kawasaki Steam Absorption Chiller – NES 630, issued by PT. Gikoko Kogyo Indonesia on 24/12/2019
26. Integrated Management System “Every Fit” Handling Instruction for Software, issued by Kawasaki Thermal Engineering Co., Ltd., 16/05/2017 for First edition
27. Sample of daily data sheet recorded by the proposed project
28-1. Ministry of Environment decree no 05 year 2012,

28-2. Environmental Impact Assessment Guidebook for Japanese Companies in Overseas Business Development, IGES, March 2015
29-1. Minutes of the LSC meeting held on 14/11/2018
29-2. Attendee's list for the LSC meeting
29-3. Invitation letter sent to the stakeholders dated on 25/10/2018
29-4. "Technology of absorption chiller" presented by Gikoko Kogyo Indonesia
29-5. "Tokyo Century Group with the JCM" presented by Tokyo Century Corporation
29-6. "MRV of the project" presented by Mitsubishi UFJ Morgan Stanley Securities
29-7. "Steam absorption chiller" presented by PT. Timuraya Tunggal
30. Specification of flow meter (DY150-DALBJ1-0D), made by Yokogawa Electric Corporation
31. Test certificate of flow meter (DY150-DALBJ1-0D) issued by Yokogawa Electric Corporation on 13/06/2018
32. User's manual of Vortex flow meter, Yokogawa Electric Corporation, 21th Edition
33. Specification of thermistor (PB3FC-43-S1), made by Shibaura Electronics Co., Ltd.
34. Ministry of Trade decree 68-2018 for Guideline for Calibration in Indonesia
35. 2016 CO_2 emission factor of the grid in Indonesia
36. Estimation of CO_2 emission reductions for the proposed project
37. Diagram of monitoring structure for the proposed project

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

Please attach certificates or curricula vitae of TPE's validation team members, technical experts and internal technical reviewers.

Statement of competence

Name: Dr. Tadashi Yoshida

Qualified and authorized by Japan Quality Assurance Organization.

Function	Date of qualification
Validator	2014/12/22
Verifier	2014/12/22
Team leader	2014/12/22

Technical area within sectoral scopes	Date of qualification
TA 1.1. Thermal energy generation	2014/12/22
TA 1.2. Renewables	2014/12/22
TA 3.1. Energy demand	2014/12/22
TA 4.1. Cement and lime production	2015/11/12
TA 5.1. Chemical industry	2014/12/22
TA 10.1. Fugitive emissions from oil and gas	2014/12/22
TA 13.1. Solid waste and wastewater	2014/12/22
TA 14.1. Afforestation and reforestation	-

Statement of competence

Name: Mr. Hiroshi Motokawa

Qualified and authorized by Japan Quality Assurance Organization.

Function	Date of qualification
Validator	2014/12/22
Verifier	2014/12/22
Team leader	2014/12/22

Technical area within sectoral scopes	Date of qualification
TA 1.1. Thermal energy generation	2014/12/22
TA 1.2. Renewables	2014/12/22
TA 3.1. Energy demand	2014/12/22
TA 4.1. Cement and lime production	2014/12/22
TA 5.1. Chemical industry	-
TA 10.1. Fugitive emissions from oil and gas	-
TA 13.1. Solid waste and wastewater	2014/12/22
TA 14.1. Afforestation and reforestation	-