JCM Validation Report Form

A. Summary of validation

A.1. General Information

Title of the project	Installation of Co-Generation Plant for On-Site Energy Supply and High Efficiency Non-Inverter Type Centrifugal Chiller in Motorcycle Factory
Reference number	TH013
Third-party entity (TPE)	Japan Quality Assurance Organization (JQA) TPE-TH-003
Project participant contracting the TPE	NIPPON STEEL ENGINEERING CO., LTD.
Date of completion of this report	25/12/2020

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 Kingdom of Thailand, in line with Thai 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.	
Monitoring	The description of the Monitoring Plan (Monitoring Plan Sheet and Monitoring Structure Sheet) is based on the approved methodology and/or Guidelines for Developing the Joint Crediting Mechanism (JCM) Project Design Document, Monitoring Plan, and Monitoring Report. The monitoring points for measurement are appropriate, as well as whether the types of equipment to be installed are appropriate if necessary.	☒
Public inputs	All inputs on the PDD of the proposed JCM project submitted in line with the Project Cycle Procedure are taken into due account by the project participants.	☒
Modalities of communications	The corporate identity of all project participants and a focal point, as well as the personal identities, including specimen signatures and employment status, of their authorized signatories are included in the MoC.	☒
	The MoC has been correctly completed and duly authorized.	☒
Avoidance of double registration	The proposed JCM project is not registered under other international climate mitigation mechanisms.	☒
Start of operation	The start of the operating date of the proposed JCM project does not predate January 1, 2013.	☒

Authorised signatory:	Mr. ☒ Ms. ☐
Last name: Asada	First name: Sumio
Title: Senior Executive	
Specimen signature: [redacted]	Date: 25/12/2020

B. Team and other experts

	Name	Company	Function*	Scheme competence*	Technical competence*	On-site visit
Mr. ☐ Ms. ☒	Sachiko HASHIZUME	JQA	Team Leader	☒	Authorized	☐
Mr. ☒ Ms. ☐	Tadashi YOSHIDA	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_TH_GL_PDD_MR_ver02.0). The latest version of the JCM PDD form (JCM_TH_F_PDD_ver02.0) is used for the PDD of the proposed project (Version 1.0 dated 24/09/2019 for First edition) The validation was conducted on the first edition of the PDD (hereinafter, "the PDD").

<Findings>

No issue was raised to the requirement.

<Conclusion based on reporting requirements>

The validation team (hereinafter, "the 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 (hereinafter, "the Guidelines for PDD").

C.2. Project description

<Means of validation>

This proposed JCM project (hereinafter, "the project") aims to improve energy efficiency at a motor cycle factory of Thai Honda Manufacturing Co., Ltd. (hereinafter, "Thai Honda") in

a suburb of Bangkok, Thailand by introducing a co-generation system (hereinafter, "CGS"), which mainly consists of a 7,800 kW gas engine and heat recovery steam generator, and a high efficiency centrifugal chiller (1,425USRt) (hereinafter, "high efficiency chiller"). The CGS and the project chiller are installed in a motorcycle factory owned by Thai Honda, but owned and operated by NS-OG Energy Solutions (Thailand) Ltd. (hereinafter, "NSET"). NSET is a group company of NIPPON STEEL ENGINEERING CO., LTD (hereinafter, "NSE"). The project can substitute the use of grid electricity at the factory and reduce the consumption of fuel.

The installation of CGS and high efficiency chiller by the project would reduce the emission reductions of 7,262 tCO_2 per year and 92,591 tCO_2 in total during the period of 2018 – 2030.

The starting date of the monitoring activity was set to be 01/04/2018, which is confirmed by reviewing the supporting documents. The expected operational lifetime of the project is 15 years, which is based on the legal lifetime issued by National Tax Agency, Japan.

The project was partially financed by Ministry of the Environment, 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, NSE has conducted education and training on the installation, operation and maintenance of the CGS and project chiller for the engineering staffs of NSET.

By reviewing the supporting documents and interviewing the PPs, without on-site visit (OV), the team has assessed the PDD and the supporting documents based on the requirements about accuracy and completeness of the project description.

The validation without OV 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 from the PPs. 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 project.

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

Regarding the project description, two issues (CAR01 and CL01) were raised and resolved as explained in "Findings".

<Findings>

<CAR01>

The technology (installation of co-generation plant) and sector that the project is implemented (on-site energy supply in motorcycle factory) is indicated in the title of the JCM project.

Meanwhile, introduction of high efficiency non- inverter type centrifugal chiller is not indicated in the title of the JCM project.

<Response by PPs>

PPs have revised the title of the JCM project.
<Assessment by TPE>
It is confirmed that all technologies applied as well as sector that the project is implemented are indicated in the title of the project, appropriately. Thus, this issue is closed.

<CL01>
In section A.2. of the PDD, the purpose of the proposed project and means of emission reductions are described.
It is requested to add more detailed explanation of the diagram of "Outline of the project", for example the definition of facilities included in the diagram, pre-project situation of electricity and chilled water supply. It is also requested to describe all the sources of electricity consumed by the project chiller.
<Response by PPs>
PPs have deleted the diagram of "Outline of the project" as it doesn't indicate the project situation accurately. Meanwhile, PPs have clarified that the project centrifugal chiller consumes grid electricity when the CGS is not running in the PDD.
<Assessment by TPE>
It is confirmed that the PDD has been revised appropriately. Thus, this issue is closed.

<Conclusion based on reporting requirements>

By reviewing the supporting documents and interviewing the PPs, the team confirms that the project description in the PDD is accurate and complete.

C.3. Application of approved methodology(ies)

<Means of validation>

The approved methodology JCM_TH_AM005_ver02.0, "Energy Saving by Introduction of High Efficiency Non-Inverter Type Centrifugal Chiller" and JCM_TH_AM009_ver01.0, "Installation of gas engine cogeneration system to supply electricity and heat" (hereinafter, "the methodologies") are applied to the project. By reviewing the relevant documents and interviewing the PPs, it is confirmed that the methodologies are applicable to the project. The project information for each eligibility criterion and the assessment and conclusion about its applicability to the project are summarized as below:

< JCM_TH_AM005_ver02.0> for high efficiency chiller

Criterion 1:

Project chiller is a non-inverter type centrifugal chiller with a capacity which is less than or

equals to 1,500 USRt.
Note : 1 USRt = 3.52 kW

Following project information is provided:
"A non-inverter type centrifugal chiller manufactured by EBARA (product model type is "RTBF150"), whose capacity is 1,425 USRt, is installed for this project."

By reviewing the specification of the project chiller and interviewing the PPs, the team confirms that the project meets this eligibility criterion.

Criterion 2:
*COP for project chiller i calculated under the standardizing temperature conditions[*1] ($COP_{PJ,tc,i}$) is more than the threshold COP values set in the table below. ("x" in the table represents cooling capacity per unit.)*

Cooling capacity per unit [USRt]	***300≤x<500***	***500≤x<800***	***800≤x≤1500***
Threshold COP value	*5.67*	*5.81*	*6.05*

$COP_{PJ,tc,i}$ *is calculated by altering the temperature conditions of COP of project chiller i* ($COP_{PJ,i}$) *from the project specific conditions to the standardizing conditions.* $COP_{PJ,i}$ *is derived from specifications prepared for the quotation or factory acceptance test data by manufacturer.*

[equation to calculate $COP_{PJ,tc,i}$*]*

$$\boldsymbol{COP_{PJ,tc,i} = COP_{PJ,i} \times [(T_{cooling-out,i} - T_{chilled-out,i} + TD_{chilled} + TD_{cooling}) \div (37 - 7 + TD_{chilled} + TD_{cooling})]}$$

$COP_{PJ,tc,i}$: *COP of project chiller i calculated under the standardizing temperature conditions* [-]*

$COP_{PJ,i}$: *COP of project chiller i under the project specific conditions [-]*

$T_{cooling-out,i}$: *Output cooling water temperature of project chiller i set under the project specific conditions [degree Celsius]*

$T_{chilled-out,i}$: *Output chilled water temperature of project chiller i set under the project specific conditions [degree Celsius]*

$TD_{cooling}$: *Temperature difference between condensing temperature of refrigerant and output cooling water temperature 1.5 degree Celsius set as a default value [degree Celsius]*

$TD_{chilled}$: *Temperature difference between evaporating temperature of refrigerant and output chilled water temperature, 1.5 degree Celsius set as a default value [degree Celsius]*

**1 : The standardizing temperature conditions to calculate $COP_{PJ,tc,i}$*

Chilled water:	*output*	*7 degrees Celsius*
	input	*12 degrees Celsius*
Cooling water:	*output*	*37 degrees Celsius*
	input	*32 degrees Celsius*

Following project information is provided:
"COP for the project chiller (RTBF150) calculated under the standardizing temperature conditions is 6.13 with a cooling capacity of 1,425 USRt, which is more than the threshold COP value set in this criterion."

By reviewing the performance test confirmation and interviewing the PPs, the team confirms that the project meets this eligibility criterion.

Criterion 3:
Periodical check is planned at least one (1) time annually.

Following project information is provided:
"Periodical check is annually planned by the manufacturer."

Regarding this criterion, an issue was raised and resolved as explained in “Findings”(CL03)

Criterion 4:
Ozone Depletion Potential (ODP) of the refrigerant used for project chiller is zero.

Following project information is provided:
"The refrigerant used for project chiller is HFC-245fa whose ODP is zero."

By reviewing the specification of the project chiller and interviewing the PPs, the team confirms that the project meets this eligibility criterion.

Criterion 5:
A plan for prevention of releasing refrigerant used for project chiller is prepared. 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-use of the equipment) is prepared. 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.

Following project information is provided:
"The project chiller has been newly installed at the project site. Measures to prevent releasing refrigerant used in the project chiller to the air will be taken when it is replaced."

Regarding this criterion, an issue was raised and resolved as explained in “Findings”(CL04).

< JCM_TH_AM009_ver01.0> for CGS

Criterion 1:
A CGS, whose electricity is generated by a gas engine(s), is newly installed and supplies electricity and heat to recipient facility(ies)..

Following project information is provided:
"A CGS manufactured by Wärtsilä Corporation (model number is “W 16V34SG”), whose power generation is driven by a gas engine, is newly installed and supplies electricity and heat to the recipient facilities."

By reviewing the specification of the project CGS and interviewing the PPs, the team confirms that the project meets this eligibility criterion.

Criterion 2:
Electricity and heat, each of which is generated in separate systems, is supplied to and consumed by recipient facility(ies) before the installation of a project CGS.

Following project information is provided:
"Before the installation of the project CGS, electricity was supplied by the grid and heat was generated by a gas boiler, and they were consumed at the recipient facilities."

By reviewing the heat distribution diagram and single line diagram of Thai Honda showing the pre-project situation and interviewing the PPs, the team confirms that the project meets this eligibility criterion.

<Findings>

<CL03>
Regarding TH_AM005_ver.02.0 Criterion 3:
It is requested to provide the plan for annual periodical check of project chiller by the manufacturer.
<Response by PPs>
The PPs have provided the following document.
-O&M manual of the project chiller including the periodical maintenance plan for the project chiller by EBARA Thermal Systems (Thailand) Co., Ltd.
<Assessment by TPE>
Through reviewing the provided document, it is confirmed that annual check is planned by the manufacturer. The team confirms that the project meets this eligibility criterion. Thus, this issue is closed.

<CL04>
Regarding TH_AM005_ver.02.0 Criterion 5:
As a prevention plan of releasing refrigerant, the daily inspection items in EBARA RTBF Centrifugal Chiller Operator's Manual are provided. However, the measures to prevent releasing refrigerant when the project chiller is replaced or removed is not provided.
<Response by PPs>
PPs have submitted a plan for prevention of releasing refrigerant used for the project chiller.
<Assessment by TPE>
It is confirmed that PPs have prepared a plan for prevention of releasing refrigerant from the project chiller when it is replaced or removed after the operational period. Thus, this issue is closed.

<Conclusion based on reporting requirements>

The team concludes that the project is eligible for applying the methodologies and all eligibility criteria have been met by the project.

C.4. Emission sources and calculation of emission reductions

<Means of validation>

In the PDD, the following emission sources are identified;

Sources of reference emissions (RE)

- Power consumption by reference chiller ,
- Electricity consumption in recipient facilities,
- Fossil fuel consumption for production of heat consumed in recipient facilities.

Sources of project emissions (PE)

- Power consumption by project chiller,
- Gas fuel consumption by CGS.

By reviewing the supporting documents and interviewing the PPs, the team confirms that all the relevant GHG emission sources covered in the methodologies are addressed for the purpose of calculating PE and RE of the project, and justified those emission sources.

Regarding the description of the emission sources in the PDD, an issue was raised and resolved as explained in "Findings"(CAR02).

The Monitoring Plan Sheet (MPS) has been prepared by using JCM_TH_AM005_ver02.0.xlsx. and JCM_TH_AM009_ver01.0.xlsx. The team confirmed that it is not altered, and its required fields are appropriately filled in.

The team assesses the values for project specific parameters fixed ex ante by taking the steps mentioned below.

There are nine project specific parameters to be fixed ex ante in the MPS for the TH_AM005.

- EF_{elec} (CO2 emission factor for consumed electricity [grid electricity])

  PPs apply 0.5664 tCO2/MWh which is the most recent value sourced from "Thailand Grid Emission Factor for GHG Reduction Project" issued on 28/09/2017 by the Analysis/Evaluation Bureau of Thailand Greenhouse Gas Management Organization (TGO). The team confirms that the value is applied appropriately.

- EF_{elec} (CO2 emission factor for consumed electricity [captive electricity])

  PPs apply 0.46 tCO2/MWh, which is the default value for Natural gas according to "Note" under the option b) of 2) captive electricity including cogeneration system, which is provided in TH_AM005. Regarding the selection of the option for determination of the value for this parameter, an issue was raised and resolved as explained in "Findings"(CL10)

- $T_{cooling\text{-}out,I}$ (Output cooling water temperature of project chiller i set under the project specific condition)

  PPs apply 39 degree Celsius which is derived from Refrigerator test record and performance test confirmation of the project chiller issued by EBARA REFRIGERATION EQUIPMENT & SYSTEMS CO., LTD. The team confirms that the value is applied appropriately.

- $T_{chilled-out,I}$ (Output chilled water temperature of project chiller i set under the project specific condition)

  PPs apply 9 degree Celsius which is derived from Refrigerator test record and performance test confirmation of the project chiller issued by EBARA REFRIGERATION EQUIPMENT & SYSTEMS CO., LTD. The team confirms that the value is applied appropriately.

- $COP_{RE,I}$ (COP of reference chiller i under the standardizing temperature conditions)

  PPs apply 6.05 which is the default value from TH_AM005 for the reference chiller with cooling capacity of 1,425 USRt. The team confirms that the value is applied appropriately.

- $COP_{PJ,I}$ (COP of project chiller i under the project specific conditions)

  PPs apply 6.13 which is derived from Refrigerator test record and performance test confirmation of the project chiller issued by EBARA REFRIGERATION EQUIPMENT & SYSTEMS CO., LTD. The team confirms that the value is applied appropriately.

- $COP_{PJ,tc,I}$ (COP of project chiller i calculated under the standardizing temperature conditions)

  PPs apply 6.13 which is calculated automatically by the function set in the MPS(input_separate) sheet in line with the eligibility criterion 2 of the TH_AM005. The team confirms that the value is applied appropriately.

- NCV_{fuel} (Net calorific value of consumed fuel)

  As PPs apply the default value for the CO2 emission factor of consumed electricity [captive electricity] when natural gas is used, in accordance with TH_AM005, this parameter is not used for the calculation of emission reductions. The team confirms it is in line with the methodology.

- EF_{fuel} (CO2 emission factor of consumed fuel)

  As PPs apply the default value for the CO2 emission factor of consumed electricity [captive electricity] when natural gas is used, in accordance with TH_AM005, this parameter is not used for the calculation of emission reductions. The team confirms it is in line with the methodology.

There are four project specific parameters to be fixed ex ante listed in the MPS for the

TH_AM009.

- η_{RE} (Reference boiler efficiency)

  PPs apply 89% which is the default value provided in TH_AM009.The team confirms that the value is applied appropriately.

- $NCV_{fuel,CGS}$ (Net calorific value of gas fuel consumed by the CGS)

  PPs apply 0.0349 GJ/mass or volume based on the value provided by the gas supplier. Regarding the source of this value, an issue was raised and resolved as explained in "Finding" (CL11).

- $EF_{fuel,RE}$ (CO2 emission factor for fossil fuel consumed by the reference boiler)

  PPs apply 0.0543 tCO2/GJ which is the lower value of CO2 emission factor of natural gas provided in table 1.4 of Ch.1 Vol.2 of 2006 IPCC Guidelines on National GHG Inventories. The team confirms that the lower value is applied appropriately.

- $EF_{fuel,PJ}$ (CO2 emission factor for gas fuel consumed by CGS)

  PPs apply 0.0583 tCO2/GJ which is the upper value of CO2 emission factor of natural gas provided in table 1.4 of Ch.1 Vol.2 of 2006 IPCC Guidelines on National GHG Inventories. The team confirms that the upper value is applied appropriately.

By interviewing the PPs and reviewing the documents relevant to the parameters and calculations of the emission reductions in the MPS, the team assesses that all the GHG emission sources specified by the methodology are identified, and that the emission reductions are correctly calculated in accordance with the methodology.

Regarding the description of the data sources for the estimated value of project parameters to be fixed ex-ante, an issue was raised and revised as explained in "Findings" (CL12).

<Findings>

<CAR02>

It is requested to list all emission sources and GHG types in one table in section C.1, and provide a separate tale for each applied methodology in Annex in the PDD.

<Response by PPs>

PPs have revised the PDD.

<Assessment by TPE>

It is confirmed that the PDD has been revised appropriately. Thus, this issue is closed.

<CL10>
PPs applied 0.431 tCO_2/MWh for EF_{elec} (CO_2 emission factor for consumed electricity [captive electricity]) to be fixed ex ante, in accordance with Option b) Calculated from measured data for captive electricity in TH_AM005. But according to "Note" under the Description of data in the methodology, a default value of 0.46 tCO_2/MWh for Natural gas may be applied. It is requested to clarify the reason for choosing the calculated value of 0.431 tCO_2/MWh.
<Response by PPs>
PPs have revised the MPS to apply the default value for Natural gas.
<Assessment by TPE>
It is confirmed that the default value of 0.46 tCO2/MWh for Natural gas is applied in accordance with TH_AM005 appropriately. Thus, this issue is closed.

<CL11>
PPs applied 0.0354 GJ/kNm3 for $NCV_{fuel,CGS}$ (Net calorific value of gas fuel consumed by the CGS) to be fixed ex ante in TH_AM009. But, it is not confirmed whether the value of 0.0354 GJ/kNm3 is provided by fuel supplier.
<Response by PPs>
PPs have submitted a supplemental document issued by gas supplier and revised the MPS.
<Assessment by TPE>
It is confirmed that the value for the $NCV_{fuel,CGS}$ is provided by fuel supplier.
PPs have revised the $NCV_{fuel,CGS}$ as 0.0349 GJ/kNm3 based on the value provided by PTT Natural Gas Distribution Company Limited, the gas supplier. Thus, this issue is closed.

<CL12>
Regarding the project specific parameters to be fixed ex ante such as $EF_{fuel,RE}$ and $EF_{fuel,PJ}$ listed in the MPS, it is requested to select the source of data for the parameter in the MPS.
<Response by PPs>
PPs have revised the MPS.
<Assessment by TPE>
It is confirmed that the source of data for the project specific parameters to be fixed ex ante has been selected in the MPS appropriately. Thus, this issue is closed.

<Conclusion based on reporting requirements>

By taking the steps mentioned above, the team concludes the following:

- All the emission sources and GHG types specified in the methodology are

appropriately identified;
- Values of parameters to be monitored *ex-post* in the MPS are correctly estimated;
- Values for the project-specific parameters to be fixed *ex-ante* listed in the MPS are correctly determined;
- Equations to calculate REs, PEs and ERs are appropriately derived;
- Annual emission reductions are correctly calculated using parameters and data in the MPS.

C.5. Environmental impact assessment

<Means of validation>

The PDD states that environmental impact assessment (hereinafter "EIA") is required under the EIA Law of Thailand. The EIA report, "Initial Environmental Examination, Energy and utility project (On-site, Co-generation Power Plant) by NS-OG Energy Solution (Thailand) for Thai Honda Manufacturing Co., Ltd." was prepared by Consultants of Technology Co., Ltd. It is confirmed that the EIA was approved on 28 September 2016 by Industrial Estate Authority of Thailand with the approval letter, "No. Aor. Gor. 5104.1.1/4710".

<Findings>

No issue was raised to the requirement.

<Conclusion based on reporting requirements>

The team concludes that PPs conducted an environmental impact assessment in line with procedures as required by the Kingdom of Thailand.

C.6. Local stakeholder consultation

<Means of validation>

The PPs have held a local stakeholders' meeting at the office of NSET located in the factory of Thai Honda Manufacturing Co., Ltd. on 22/08/2018. Prior to the meeting, the PPs invited the stakeholders and the participants including the officials from Thailand Greenhouse Gas Management Organization, Ministry of Natural Resources and Environment, management personnel from Thai Honda and local stake holders, etc.

By reviewing the relevant documents and interviewing the PPs, it is confirmed 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 team concludes that the PPs have appropriately completed a local stakeholder consultation process and invited comments from the local stakeholders relevant to the project. 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 Sheets (MPS) and Monitoring Structure Sheets (MSS) provided by the methodologies.

Regarding the MPS for TH_AM005 (Chiller), three monitoring parameters, *i.e.*, $EC_{PJ.i.p}$ (Power consumption of project chiller i during the period p), $FC_{PJ,p}$ (The amount of fuel input for power generation during monitoring period p) and $EG_{PJ,p}$ (The amount of electricity generated during the period p) are listed in accordance with the applied methodology. As mentioned in section C.4. of this report, PPs apply the default value (0.46 tCO_2/MWh) of the CO_2 emission factor for consumed electricity [captive electricity] for Natural gas, $FC_{PJ,p}$ and $EG_{PJ,p,}$ are not used for the calculation of CO_2 emission factor for consumed electricity of the project chiller. $EC_{PJ.i.p}$ is measured by the electricity meters.

Regarding the MPS for AM009 (CGS), three monitoring parameters, *i.e.*, $EC_{i.p}$ (Amount of electricity consumed by the recipient facility i which is generated by the CGS during the period p) , $HC_{i,,p}$ (Amount of heat consumed by the recipient facility i which is generated by the CGS during the period p) and $FC_{CGS,p}$ (Amount of gas fuel consumed by the CGS during the period p) are listed in accordance with the applied methodology. $EC_{i.p}$ is measured by the electricity meters. The heat generated by the CGS is consumed by the recipient facilities in the form of hot water and steam. Therefore, $HC_{i,,p}$ for hot water and steam is monitored separately. $HC_{i,,p}$ for hot water and steam is calculated by using the data measured by flowmeters and thermometers which are installed at the monitoring points. Meanwhile, $FC_{CGS,p}$ is monitored by applying data on invoice provided by gas fuel supplier.

Regarding the calibration frequency of the measurement equipment installed for the project, there is no clear regulation in the host country. Also, the manufactures of those equipment have not provided any recommendation on the calibration interval. Therefore, PPs decide the calibration procedures as below;

Electricity meters:

The accuracy error of the power meter is checked once a year, and if the accuracy error exceeds the allowable value, it is calibrated or replaced.

Flow meters:

Flow meter is calibrated every 1 year.

Considering the common practice of the QA/QC procedures for measurement equipment in other GHG emissions reduction projects such as CDM, the team determines that the calibration frequency is reasonable and acceptable to ensure the appropriateness of the monitoring activity.

Regarding the indication of monitoring points in the PDD, an issue was raised and resolved as explained in "Findings"(CL02).

Regarding the description of measurement methods and procedures, some issues were raised and resolved as explained in "Findings"(CL05-CL08).

Regarding the estimated value for parameters to be monitored ex-post, an issue was raised and resolved as explained in "Findings"(CL09)

The roles and responsibilities of the personnel are described in the MSS. The monitoring structure consists of the following personnel;

Section Manager, NIPPON STEEL ENGINEERING CO., LTD.

Operation Manager, NS-OG Energy Solutions (Thailand) Ltd.

Plant Manager, NS-OG Energy Solutions (Thailand) Ltd.

Regarding the description of the roles and responsibility, an issue was raised and resolved as explained in "Findings"

By applying the stepwise process, the team confirms the compliance of monitoring plan with the methodology and the Guidelines for PDD. Also, by reviewing the relevant documents and interviewing the PPs, the team confirms that the monitoring structure in the MSS are feasible within the project design, and that the means of implementation of the monitoring plan, including the data management and QA/QC procedures, are sufficient for ex post reporting and verification.

Regarding the monitoring structure, an issue was raised and resolved as explained in "Findings"(CL13).

<Findings>

< CL 02>

Regarding section C.2. Figure of all emission sources and monitoring points relevant to the JCM project, it is requested to clarify the following issues;

1) It is requested to indicate the monitoring points in Chiller area in line with TH_AM005.

2) Monitoring point No. (2) $FC_{PJ,p}$ (Amount of fuel input for power generation during monitoring period p) and Monitoring point No. (3) $EG_{PJ,p}$ (Amount of electricity generated during the monitoring period p) of TH_AM005 are not clearly described in CGS area.

3) It is requested to clarify how many electricity meters are installed for Monitoring point No.(1) $EC_{i,p}$ (Amount of electricity consumed by the recipient facility i which is generated by the CGS during period p) of TH_AM009.

< Response by PPs >

PPs have revised the PDD.

< Assessment by the TPE >

It is confirmed that the figure is revised appropriately to clarify the issues. Thus, this issue is closed.

< *CL05* >

Regarding Measurement methods and procedures for parameters to be monitored ex-post, it is requested to describe the details on accuracy level of the equipment if the monitoring option is C.

< Response by PPs >

PPs have revised the MPS.

< Assessment by the TPE >

It is confirmed that the accuracy level of the monitoring equipment is described based on the specifications. Thus, this issue is closed.

< *CL06* >

It is requested to clarify why the calibration information for the following two parameters is not consistent;

For TH_AM005 <Chiller>:

(3) $EG_{PJ,p}$ (The amount of electricity generated during the monitoring period p)

For TH_AM009 <CGS>:

(1) $EC_{i,p}$ (Amount of electricity consumed by the recipient facility i which is generated by the CGS during the period p)

< Response by PPs >

PPs have revised the MPS.

< Assessment by the TPE >

It is confirmed that the calibration information for those two parameters has been revised appropriately. Thus, this issue is closed.

< *CL07* >

As for $HC_{i,p}$ (Amount of heat consumed by the recipient facility i which is generated by the CGS during the period p) , it is calculated by using the data measured by flow meter and thermometer. It is requested to describe the equation for $HC_{i,p}$ in the Measurement method and procedures.

< Response by PPs >

PPs have revised the MPS.

< Assessment by the TPE >

It is confirmed that the measurement methods and calculation procedures of HCi,p for hot water and steam have been described appropriately. Thus, this issue is closed.

< *CL08* >

The monitoring frequency for the parameters of TH_AM005 is described as "Continuously", meanwhile it is described as "Monthly" for the parameters of TH_AM009. It is requested to clarify the inconsistency.

< Response by PPs >

PPs have revised the MPS.

< Assessment by the TPE >

It is confirmed that the description on the monitoring frequency has been revised appropriately. Thus, this issue is closed.

< *CL09* >

Regarding the estimated value for parameters to be monitored ex-post, it is requested to clarify the following issues;

1) The operation hours of CGS is 18 hours/day, but it is 24 hours/day for chiller, it is requested to clarify this difference.

2) As for HCi,p (Amount of heat consumed by the recipient facility i which is generated by the CGS during the period p), only hot water consumption is calculated, it is requested to clarify why the steam consumption is not included in the estimation of the amount of heat consumption.

< Response by PPs >

1) The CGS is not operated in the night time, but chiller is operated 24 hours.

2) PPs have revised the MPS to include the steam consumption.

< Assessment by the TPE >

It is confirmed that the issues have been clarified appropriately and the MPS has been revised appropriately. Thus, this issue is closed.

<*CL13* >
The PPs indicate the roles and responsibilities of personnel in the Monitoring Structure Sheet (MSS).
The procedures for data archiving is not clearly described.
< Response by PPs >
PPs have revised the MSS.
< Assessment by the TPE >
It is confirmed that the procedures for data archiving is clearly described in the MSS. Thus, this issue is closed.

<Conclusion based on reporting requirements>
The team concludes that the monitoring plan described in the MPS and MSS complies with the methodology and the Guidelines for PDD, and is feasible for the PPs to implement the monitoring plan.

C.8. Modalities of Communication

<Means of validation>

The MoC was provided to JQA on 23/12/2019, in the valid form, JCM_TH_F_MoC_ver01.0, at the time of validation, in which NSE is nominated as the focal point.

By directly checking the evidences, i.e. personal business cards, specimen signatures including the signatures on the participant list of local stakeholder meeting and the relevant websites, it is confirmed that the latest version of the form, JCM_TH_F_MoC_ver01.0, is used, that the information is correctly completed and duly authorized, and that all corporate and personal details described in the MOC are valid and accurate.

<Findings>

No issue was raised to the requirement.

<Conclusion based on reporting requirements>

The team concludes the following:

- The latest version of the form, JCM_TH_F_MoC_ver01.0, is used;
- All corporate and personal details described in the MOC are valid and accurate;
- Information is correctly completed and duly authorized.

C.9. Avoidance of double registration

<Means of validation>

By reviewing the written confirmation in the Section 7 of the MoC, it is confirmed that the project is not registered under other international climate mitigation mechanisms.

In addition, the team assessed the publicly available information (e.g. CDM/JI website, etc.) to confirm that no identical project as the project in terms of the name of entities, applied technology, scale and the location.

<Findings>

No issue was raised to the requirement.

<Conclusion based on reporting requirements>

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

C.10. Start of operation

<Means of validation>

The start date for the operation of the proposed JCM project is described in the PDD as 01/04/2018.

By reviewing the confirmation letter signed by Thai Honda and NSET, the team confirms that the starting date of project operation is 01/04/2018 as described in the PDD.

<Findings>

No issue was raised to the requirement.

<Conclusion based on reporting requirements>

The team concludes that the starting date is 01/04/2018, which does not predate 01/01/2013.

C.11. Other issues

<Means of validation>

No more issues are raised in the validation of the 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 28/01/2020 to 26/02/2020 to invite public comments on the following JCM website: https://www.jcm.go.jp/th-jp/projects/74

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

Name	Title	Organization
Mr. Takuya OOISHI	Manager, On-Site Energy Service Marketing Section, Energy Solution Business Development Department, Business Development Division, Environmental & Energy Solution Sector	NIPPON STEEL ENGINEERING CO.,LTD.
Mr. Kensuke KOHNO	Senior Manager, Project Management Section, Energy Solution & Engineering Department, Engineering Division, Environmental & Energy Solution Sector	NIPPON STEEL ENGINEERING CO.,LTD.

Mr. Kei SATO	Consultant, Consulting Business Division, Optimum Solution Business Unit, Social Innovation Co-Creation Dept., Environmental and Energy Business Consulting Group	Mitsubishi UFJ Research and Consulting Co., Ltd

E.2. List of documents received

1	Project Design Document (ver.01.0 dated 24/09/2019 and 02.0 dated 14/10/2020)
2	Monitoring Plan Sheet and Monitoring Structure Sheet “JCM_TH_AM005_ver02.0_NSE_190924” “JCM_TH_AM009_ver01.0_NSE_190924” “JCM_TH_AM005_ver02.0_NSE_200818” “JCM_TH_AM009_ver01 0_NSE_201127”
3	MoC submitted for JCM secretariat for public comments
4	Business cards of Primary authorized signatory, Alternate authorized signatory from Japanese and Thailand sides
5	JCM Approved Methodology (JCM_TH_AM005_ver02.0) "Energy Saving by Introduction of High Efficiency Non Inverter Type Centrifugal Chiller ,Version 0 2 .0"
6	Monitoring Spreadsheet (JCM_TH_AM005_ver02.0)
7	JCM Approved Methodology (JCM_TH_AM009_ver01.0) "Installation of gas engine cogeneration system to supply electricity and heat, Version 01.0"
8	Monitoring Spreadsheet (JCM_TH_AM009_ver01.0)
9	JCM Modalities of Communication Statement Form (JCM_TH_F_MoC_ver01.0)
10	JCM Glossary of Terms (JCM_TH_Glossary_ver01.0)
11	JCM Project Cycle Procedure (JCM_TH_PCP_ver02.0)

12	JCM Project Design Document Form (JCM_TH_F_PDD_ver02.0)	
13	JCM Guidelines for Developing Project Design Document and Monitoring Report (JCM_TH_GL_PDD_MR_ver02.0)	
14	JCM Validation Report Form (JCM_TH_F_Val_Rep_ver01.0)	
15	JCM Guidelines for Validation and Verification (JCM_TH_GL_VV_ver01.0)	
16	Outline of the proposed project "Installation of Co-Generation Plant for On-Site Energy Supply in Motorcycle Factory" http://gec.jp/jcm/projects/15pro_tha_05/	
17	Company profiles of NS-OG Energy Solutions (Thailand) Ltd. http://www.nset.co.th/	
18	Company profiles of NIPPON STEEL ENGINEERING CO., LTD. https://www.eng.nipponsteel.com/	
19	Company profiles of Thai Honda Manufacturing Co., Ltd.	
20	Layout map of the project site before the project implementation "Layout modify machine PO1-PO4" and "Map of Existing Carpark2016.02.21"	
21	Layout map of the project site after the project implementation "Thai HONDA Layout"	
22	Single line diagram of the project site before the project implementation "SINGLE LINE DIAGRAM OF 24kV DISTRIBUTION LINE 27-05-16.dwg rv.00-Model"	
23	Single line diagram of the project site after the project implementation "THM Single line diagram 24kV-6.6kV Line"	
24	Piping diagram of the project site before the project implementation "Thai Honda Manufacturing Site Layout Plan"	
25	Piping diagram of the project site after the project implementation "THM project P&ID Symbol List"	
26	Evidence to demonstrate the starting date of project operation (01/04/2018) "Confirmation letter"	
27	Evidence to demonstrate the expected operational lifetime (15 years) of the proposed JCM project "Legal durable year list issued by Ministry of Finance, Japan"	
28	Information on the financial support from MoE （http://gec.jp/jcm/jp/kobo/mp190802/）	

29	Records and texts of the staff training or seminar for technology transfer from Japan to Thailand "Operator training record"	
30	Catalogue and specification of project chiller "Specification data sheet of RTBF150"	
31	Specifications prepared for the quotation or factory acceptance test data by manufacturer showing COP of project chiller in the project specific conditions "Refrigerator test record"	
32	O&M manual of the project chiller and record of periodical check "NS-OG (Lad)_CEN_Performance test report" "NS-OG (Ladkrabang)_Annual maintenance" "routine report"	
33	A plan for prevention of releasing refrigerant used for project chiller "EBARA RTBF Centrifugal Chiller Operator's Manual"	
34	Catalogue and specification of the project co-generation system "Plant details based on PerfPro 2015.1 and Plant performance"	
35	Catalogue and specification of the existing boiler "Delivery specification"	
36	Legal requirement and procedures of environmental impact assessment (EIA) in Thailand "Guideline for getting the license of electricity business" "IGES Thai EIA guideline"	
37	Conclusion of environmental impact assessment (EIA) of the project "NSET Initial Environmental Examination Report" "The result of Initial Environmental Examination report, Energy and utility project (On-site, Cogeneration Power Plant) for Thai Honda Manufacturing Co., Ltd. by NS-OG Energy Solution (Thailand), LTD., is located in Ladkrabang Industrial Estate."	
38	Agenda of the local stakeholder consultation meeting and Invitation letter	
39	Candidate list of the local stakeholder consultation with signature	
40	Presentation materials used at the local stakeholder consultation meeting "LSC_NSET_Explanation for THM project_20180822"	
41	Simulation and plan for CO2 emission reductions	

42	2006 IPCC Guidelines for National Greenhouse Gas Inventories
43	Thailand Grid Emission Factor for GHG Reduction Project/Activity
44	Specification of monitoring equipment for electricity generation and consumption "Power Analyzer UMG 96 RM-E Residual current monitoring (RCM) Operating instructions and technical data"
45	Specification of monitoring equipment for heat consumption "Specification sheet of DELTA FLOW METER " "Specification drawing of EMT412DACEFAA Magnetic tracking type area flow meter" "Specification list of MTG18A Smart two wire Electromagnetic Flowmeter" "Specification of terminal head"
46	PTT Natural Gas Distribution Company Limited Natural Gas Operation Statement of Gas Delivered

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

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

Statement of competence

Name: Ms. Sachiko Hashizume

Qualified and authorized by Japan Quality Assurance Organization.

Function

	Date of qualification
Validator	2015/11/20
Verifier	2015/11/20
Team leader	2018/6/22

Technical area within sectoral scopes

	Date of qualification
TA 1.1. Thermal energy generation	2015/11/20
TA 1.2. Renewables	2015/11/20
TA 3.1. Energy demand	2015/11/20
TA 4.1. Cement and lime production	-
TA 5.1. Chemical industry	-
TA 10.1. Fugitive emissions from oil and gas	-
TA 13.1. Solid waste and wastewater	2015/11/20
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 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	-