JCM Project Design Document Form

A. Project description

A.1. Title of the JCM project

Energy Saving for Air-Conditioning at Shopping Mall with High Efficiency Centrifugal Chiller

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

The proposed JCM project aims to improve electricity consumption by introducing an advanced and efficient centrifugal chiller system to the shopping mall in Surabaya, the Republic of Indonesia.

The project is to replace existing 5 central cooling systems with high efficient centrifugal chiller in the shopping mall as well as to replace existing 8 cooling towers with efficient Japanese models.

These existing chillers were replaced with one high-efficiency centrifugal chiller of 569 USRt and four high-efficiency centrifugal chiller of 966 USRt by the project.

The key technology is the new type economizer. Improvement of vapor-liquid separation performance and significant downsizing are realized by use of newly developed economizer.

A.3. Location of project, including coordinates

Country	The Republic of Indonesia
Region/State/Province etc.:	Jawa Timur
City/Town/Community etc:	Surabaya
Latitude, longitude	S 7°26'27.4" and E 112°73'95.9"

A.4. Name of project participants

The Republic of Indonesia	PT.PAKUWON JATI Tbk
Japan	NTT FACILITIES, INC.

A.5. Duration

Starting date of project operation	01/12/2016
Expected operational lifetime of project	15 years

A.6. Contribution from developed countries

The proposed JCM Project was partially supported by the Ministry of Environment, Japan

through the financing programme for JCM model projects, which provided financial support up to 50% of initial investment for the projects in order to acquire JCM credits.
The technology of advanced and efficient centrifugal chiller system is introduced in the proposed project by the Japanese project participant. The Japanese project participant transfers the technology through conducting the training on operation and maintenance of newly installed equipment through trial operation.

B. Application of an approved methodology(ies)

B.1. Selection of methodology(ies)

Selected approved methodology No.	JCM_ID_AM002
Version number	ver02.0

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

Eligibility criteria	Descriptions specified in the methodology	Project information
Criterion 1	Project chiller is a centrifugal chiller with a capacity of less than 1,250 USRt. * 1 USRt = 3.52 kW	The capacities of the chillers introduced in the project are 569USRt and 996 USRt.
Criterion 2	COP for project chiller *i* calculated under the standardizing temperature conditions* ($COP_{PJ,tc,i}$) is more than 6.0. $COP_{PJ,tc,i}$ is a recalculation of COP of project chiller i ($COP_{PJ,i}$) adjusting temperature conditions from the project specific condition to the standardizing conditions. $COP_{PJ,i}$ is derived in specifications prepared for the quotation or factory acceptance test data at the time of shipment by manufacturer. [Equation to calculate $COP_{PJ,tc,i}$] $COP_{PJ,tc,i} = COP_{PJ,i} \times [(T_{cooling\text{-}out,i} - T_{chilled\text{-}out,i} + TD_{chilled} + TD_{cooling}) \div (37 - 7 + TD_{chilled} + TD_{cooling})]$ *$COP_{PJ,tc,i}$: COP of project chiller i calculated under the standardizing temperature conditions* [-]* *$COP_{PJ,i}$: COP of project chiller i under the project specific conditions [-]* *$T_{cooling\text{-}out,i}$: Output cooling water temperature of project chiller i set under the project specific condition [degree Celsius]* *$T_{chilled\text{-}out,i}$: Output chilled water temperature of project chiller i set under the project specific condition [degree Celsius]* *$TD_{cooling}$: Temperature difference between condensing*	The COP for project chiller ($COP_{PJ,tc,i}$) which are introduced to the proposed project are 6.14 and 6.11. [Calculation result] <996 USRt > 5.99 x (36.89 – 6.07 + 1.5 + 1.5) / (37.0 – 7 + 1.5 + 1.5) = 6.1388 6.14 <569 USRt > 5.98 x (36.85– 6.12 + 1.5 + 1.5) / (37.0 – 7 + 1.5 + 1.5) = 6.1123 6.11

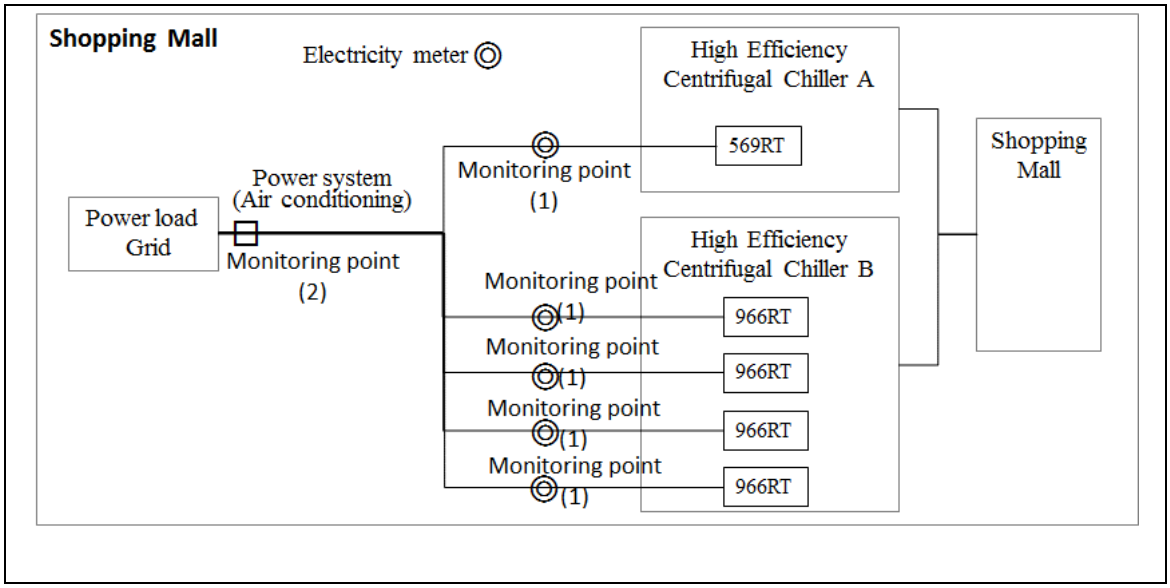
	temperature of refrigerant and output cooling water temperature 1.5 degree Celsius set as a default value [degree Celsius] *$TD_{chilled}$: Temperature difference between evaporating temperature of refrigerant and output chilled water temperature, 1.5 degree Celsius set as a default value [degree Celsius]* **The standardizing temperature conditions to calculate $COP_{PJ,tc,i}$* *Chilled water: output 7 degree Celsius* *input 12 degree Celsius* *Cooling water: output 37 degree Celsius* *input 32 degree Celsius*	
Criterion 3	Periodical check is planned more than four (4) times annually.	Periodical check is planned four times annually. Letter of consent on the conductance of periodical check four times annually for the project chiller was prepared by participants from both sides.
Criterion 4	Ozone Depletion Potential (ODP) of the refrigerant used for project chiller is zero.	As for the existing chiller, R123 of the HCFC is used for a refrigerant. Refrigerant for the project chiller is HFC R134a, whose ODP is zero.
Criterion 5	Plan for not releasing refrigerant used for project chiller is prepared. In the case of replacing the existing chiller with the project chiller, refrigerant used for the existing chiller is not released to the air.	Letter of consent on not releasing refrigerant used for project chiller and existing chillers were prepared by participants from both sides.

C. Calculation of emission reductions

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

Reference emissions	
Emission sources	GHG type
Power consumption by reference chiller	CO_2
Project emissions	
Emission sources	GHG type
Power consumption by project chiller	CO_2

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



C.3. Estimated emissions reductions in each year

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2016	925	893	32
2017	11,105	10,719	386
2018	11,105	10,719	386
2019	11,105	10,719	386
2020	11,105	10,719	386
Total (tCO_{2e})	45,345	43,769	1,576

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

E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

The project participant identified the following stakeholders, accommodating the suggestions from Indonesian JCM Secretariat.
[Direct stakeholders] Staff member of PT Pakuwon Jati Tbk
[Indirect stakeholders] Officer of Institute Technology of 10 November and Surabaya city government (BPLH)
The project participant conducted a face-to-face interview with Indonesia JCM Secretariat and local stakeholder consultation with identified stakeholders (see table below). Comments received from the participants of the local stakeholder consultation are summarized in the following section E.2. below. The project received no negative comments from the participants of the local stakeholder consultation, and, also, it was confirmed that none of the received comments requires further mitigation action from the project side.

#	date	Venue	Method	Attendance
1	October 31, 2016 10:00 ~ 10:25	Meeting Room of Indonesia JCM Secretariat (GKKBP 4th Floor)	Face-to-face interview	Indonesia JCM Secretariat
2	November 8, 2016 11:00 ~ 12:00	Meeting Room in Tunjungan Plaza-3 7th Floor, Sappire	Local stakeholder consultation	Shopping mall director Indonesia JCM Secretariat Local institution Local government

E.2. Summary of comments received and their consideration

Stakeholders	Comments received	Consideration of comments received
Shopping mall facility manager	He would like to compare electricity consumption between BPLH's data and NTTF's data after the installation of new Chillers is finished.	The data will be sent by the project participants to the shopping mall director.
Local government (Surabaya government) official	She appreciates and is thankful, and she does not make any particular comment on this project.	No action is necessary.
Local institution official	He appreciates that how this kind of project contributes to the creation of low carbon communities. He asks about: 1) the project	He was informed that: 1) the project will be monitored by NTTF; 2) the possibility to apply for a JCM project depends on the condition of

	after installation of chillers is finished ; 2) whether it is possible for a university/institution to apply for a JCM project to implement an energy saving HVAC system; and 3) how their activity to be informed to the public.	each potential case; and 3) the shopping mall director will coordinate with Surabaya government.

F. References

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

Annex

Revision history of PDD

Version	Date	Contents revised
01.0	**/**/2016	First edition