JCM Project Design Document Form

A. Project description

A.1. Title of the JCM project

Energy Saving for Air-Conditioning and Process Cooling by Introducing High-efficiency Centrifugal Chiller

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

The proposed JCM project aims to improve energy saving for air-conditioning and process cooling by introducing high-efficiency centrifugal chiller in a textile factory in Indonesia. The factory needs considerable electricity, and chillers consume significant amount of energy compared with the other machines in the factory. The proposed project covers a textile factory of PT. Primatexco Indonesia in Batang, Central Java province in Indonesia. The cooling requirements of the project are 500 USRt. Before the project, two existing chillers whose plate capacity is 230 USRt (centrifugal chiller) and 400 USRt (absorption chiller using steam from fossil fuels) are operated with the actual capacity of 200 USRt and 250 USRt respectively in the factory. These chillers were replaced with one high-efficiency centrifugal chiller of 500 USRt by the project.

A.3. Location of project, including coordinates

Country	Republic of Indonesia
Region/State/Province etc.:	Central Java Province
City/Town/Community etc:	Batang
Latitude, longitude	S 6°55' 0", E 109°44'53"

A.4. Name of project participants

The Republic of Indonesia	PT. Primatexco Indonesia
Japan	Nippon Koei Co., Ltd. (Focal Point) Ebara Refrigeration Equipment & Systems Co., Ltd.

A.5. Duration

Starting date of project operation	01/03/2014
Expected operational lifetime of project	7 years

A.6. Contribution from developed countries

The proposed project was financially supported by the Ministry of the Environment, Japan through the financing programme for JCM model projects which seeks to acquire JCM credits. As for technology transfer, Ebara Refrigeration Equipment & Systems Co., Ltd. (ERS) has provided the following supports to PT. Primatexco: ● Direct instruction on proper operation, and ● The opportunity for local operators to visit buildings in Japan where district heating and cooling system are being operated and to learn actual status of chiller utilization.

B. Application of an approved methodology(ies)

B.1. Selection of methodology(ies)

Selected approved methodology No.	ID_AM002
Version number	1.0

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*	Project chiller (Ebara high efficiency centrifugal chiller : RTBF 050) is a centrifugal chiller with a capacity of 499 USRt. [Calculation] 1758 [kW] / 3.52 = 499.4 ≒ 499 [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.	The COP for project chiller ($COP_{PJ,tc,i}$) which is introduced to the proposed project is 6.01. [Calculation result] 7.66 x (36.9 – 14 + 1.5 + 1.5) / (37.0 – 7 + 1.5 + 1.5) = 6.0119 ≒ 6.01

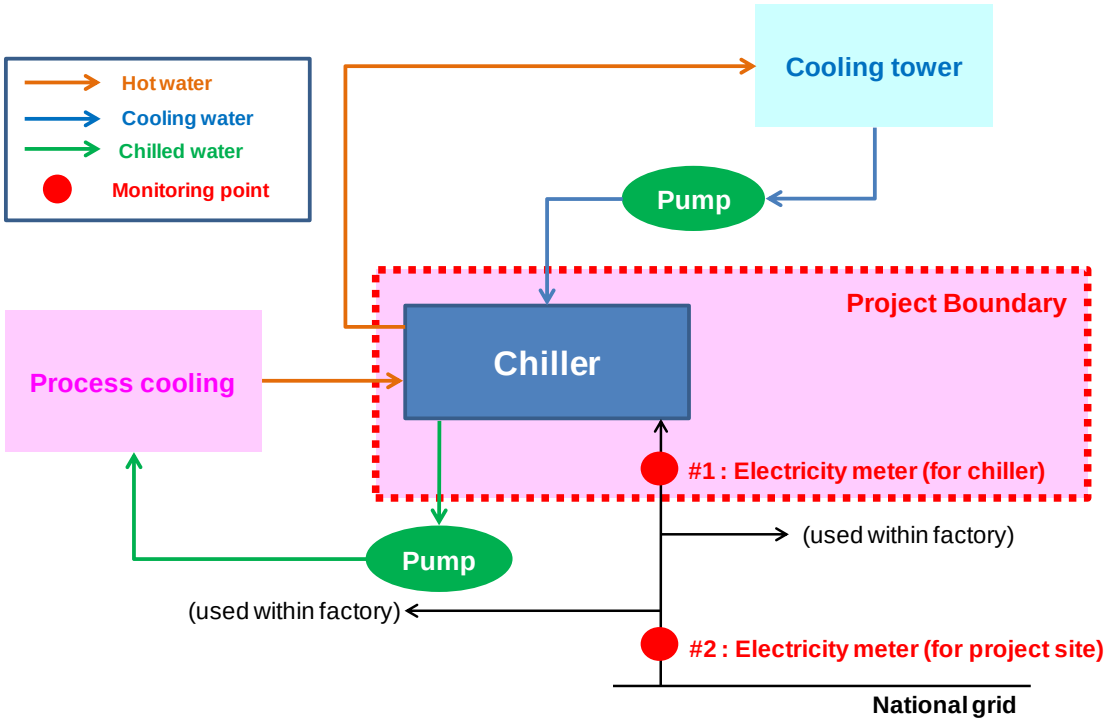
	[Equation to calculate $COP_{PJ,tc,i}$] $\mathbf{COP_{PJ,tc,i} = COP_{PJ,i} \times [(T_{cooling-out,i} - T_{chilled-out,i} + TD_{chilled} + TD_{cooling}) \div (37 - 7 + TD_{chilled} + TD_{cooling})]}$ $COP_{PJ,tc,i}$: *COP of project chiller i calculated under the standardizing temperature conditions* [-]* $COP_{PJ,i}$: *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 condition [degree Celsius]* $T_{chilled-out,i}$: *Output chilled water temperature of project chiller i set under the project specific condition [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]* *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.	PT Ebara Indonesia (subsidiary of the ERS which is a chiller manufacturer) agreed to conduct periodical checks more than four (4) times annually, in order to check the troubles occurred from the last check.
Criterion 4	Ozone Depletion Potential (ODP) of the refrigerant used for project chiller is zero.	Refrigerant for the project chiller is HFC 245fa, 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 was prepared by PT Primatexco.

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



#1 : Electric meter for power consumption of project chiller i. It will be replaced with domestic /international standards.

#2 : Electric meter for electricity imported from the grid to the project site

Note : There is no generator in this site, so "h_{gen}" is not applicable in this PDD.

C.3. Estimated emissions reductions in each year

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2013	0.00	0.00	0.00

2014	1,393.41	1,295.62	97.00
2015	1,672.09	1,554.74	117.00
2016	1,672.09	1,554.74	117.00
2017	1,672.09	1,554.74	117.00
2018	1,672.09	1,554.74	117.00
2019	1,672.09	1,554.74	117.00
2020	1,672.09	1,554.74	117.00
Total (tCO_{2e})	11,425.95	10,624.06	799.00

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

Since the project activity is limited to installation of a new environmental friendly chiller in the existing textile factory with a limited level of potential social and environmental impact, the PP identified direct stakeholders as the factory staff related to chiller operations, namely the plant manager and supervisor.

As a JCM project, indirect stakeholders are identified to be staff of local governments since they enjoy the benefit of the project (GHG reduction, energy saving, capacity development within their administrative boundary. Thus, the PP identified provincial and district governments as well.

The PP conducted a face-to-face interview with identified stakeholders. The interviews were conducted 5 times (see table below).

#	Date	Venue	Method
1	Sep. 7, 2013	Meeting room or factory of PT. Primatexco	Face-to-face interview
2	Sep. 25, 2013	Meeting room or factory of PT. Primatexco	Face-to-face interview
3	Nov. 25 to 27, 2013	Meeting room of ERS etc. in Japan	Face-to-face interview
4	Feb. 3, 2014	Meeting room or factory of PT. Primatexco	Face-to-face interview
5	Sept. 1, 2014	Meeting room of Bappeda of Central Java Province	Face-to-face interview

In terms of chiller replacement, some comments were received from local stakeholders.

E.2. Summary of comments received and their consideration

Stakeholders	Comments received	Consideration of comments received
Plant manager	It is helpful that high-efficiency chiller can contribute to not only energy saving but also cost reduction. And, it is appreciated that Ebara chiller has high reliability equipment based on the existing chiller performance and periodical check/maintenance service.	No action is needed.
Supervisor	New chiller is helpful for daily operation/monitoring work with micro-computer control panel.	No action is needed.
Local governments (Provincial Government of Central Java Province and Regency (Kabupaten) Government of Batang)	(1) Local governments are satisfied with this cooperation between Japan and Indonesia. Local governments will fully support this project. (2) Local Governments would like to recommend the JCM application for small and medium enterprises (SME). (3) Local Governments would like to request for continuous information sharing.	(1) : No action is needed. (2): In case any needs of SME to apply this methodology (or other ideas to reduce GHG) are confirmed, the local governments are suggested to contact with Indonesian JCM secretariat. (3): The focal point entity will continue sharing the information through submission of periodical report to Joint Committee for JCM.

F. References

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

Annex

Revision history of PDD

Version	Date	Contents revised

1.0	24/09/2014	First edition
2.0	27/10/2014	Second edition

Monitoring Plan Sheet (Input Sheet) [Attachment to Project Design Document]

Table 1: Parameters to be monitored *ex post*

(a) Monitoring point No.	(b) Parameters	(c) Description of data	(d) Estimated Values	(e) Units	(f) Monitoring option	(g) Source of data	(h) Measurement methods and procedures	(i) Monitoring frequency	(j) Other comments
(1)	$EC_{PJ,i,p}$	Power consumption of project chiller *i* during the period *p*	1,910	MWh/p	Option C	Monitored data	**[The case for use of measuring equipment]** Data is measured by measuring equipments in the factory. - Specification of measuring equipments: 1) Electrical power meter is applied for measurement of electrical power consumption of project chiller. 2) Meter is certified with national/international standards on electrical power meter. - Measuring and recording: 1) Measured data is recorded and stored in the measuring equipments. 2) Recorded data is checked its integrity once a month by responsible staff. - Accuracy level: ±1.0% or better - Calibration: Every year after the installation by a qualified agency. - QA/QC: Continuous measurement and at least monthly recording from logger sysytem to PC. **[The case for auto data collection]** Data is collected automatically and sent through Internet to a server. - Specification of measuring equipments: 1) Electrical power meter is applied for measurement of electrical power consumption of project chiller. 2) Meter is certified with national/international standards on electrical power meter. - Measuring and recording: 1) Measured data is automatically sent to a server where data is recorded and stored. 2) Recorded data is checked its integrity once a month by responsible	Continuously	
(2)	$EI_{grid,p}$	Electricity imported from the grid to the project site during the period *p*	59,813	MWh/p	Option B	Invoice from the power company	Data is collected and recorded from invoices from the power company (PT PLN).	Every month	
(3)	$h_{gen,p}$	Operating time of captive electricity generator during the period *p*	0	hours/p	Option C	Monitored data	Data is measured by meter equipped to a generator.	Continuously	In the project, there is no generator for captive electricity. Thus, this parameter is not applicable for this project.

Table 2: Project-specific parameters to be fixed *ex ante*

(a) Parameters	(b) Description of data	(c) Estimated Values	(d) Units	(e) Source of data	(f) Other comments
EF_{elec}	[For grid electricity] CO_2 emission factor for consumed electricity	0.814	tCO_2/MWh	The most recent value available at the time of validation is applied and fixed for the monitoring period thereafter. The data is sourced from “Emission Factors of Electricity Interconnection Systems”, National Committee on Clean Development Mechanism Indonesian DNA for CDM unless otherwise instructed by the Joint Committee.	
EF_{elec}	[For captive electricity] CO_2 emission factor for consumed electricity	0.8	tCO_2/MWh	CDM approved small scale methodology: AMS-I.A	In the project, there is no generator for captive electricity.
$T_{cooling-out,i}$	Output cooling water temperature of project chiller i set under the project specific condition	36.9	degree Celsius	Specifications of project chiller i prepared for the quotation or factory acceptance test data by manufacturer	
$T_{chilled-out,i}$	Output chilled water temperature of project chiller i set under the project specific condition	14	degree Celsius	Specifications of project chiller i prepared for the quotation or factory acceptance test data by manufacturer	
$COP_{RE,i}$	COP of reference chiller i under the standardizing temperature conditions	5.59	-	Selected from the default values set in the methodology	
$COP_{PJ,i}$	COP of project chiller i under the project specific conditions	7.66	-	Specifications of project chiller i prepared for the quotation or factory acceptance test data by manufacturer	
$COP_{PJ,tc,i}$	COP of project chiller i calculated under the standardizing temperature conditions	6.01	-	Calculated with the following equation; $COP_{PJ,tc,i}= COP_{PJ,i} \times [(T_{cooling-out,i} - T_{chilled-out,i} + TD_{chilled} + TD_{cooling}) \div (37 - 7 + TD_{chilled} + TD_{cooling})]$	
RC_{gen}	Rated capacity of generator	0.0	kW	Specification of generator for captive electricity	

Table3: *Ex-ante* estimation of CO_2 emission reductions

CO_2 emission reductions	Units
117	tCO_2/p

[Monitoring option]

Option A	Based on public data which is measured by entities other than the project participants (Data used: publicly recognized data such as statistical data and specifications)
Option B	Based on the amount of transaction which is measured directly using measuring equipments (Data used: commercial evidence such as invoices)
Option C	Based on the actual measurement using measuring equipments (Data used: measured values)

Monitoring Plan Sheet (Calculation Process Sheet) [Attachement to Project Design Document]

1. Calculations for emission reductions	Fuel type	Value	Units	Parameter
Emission reductions during the period p	N/A	117.00	tCO_2/p	ER_p
2. Selected default values, etc.				
COP of reference chiller i under the standardizing temperature conditions	N/A	5.59	-	$COP_{RE,i}$
3. Calculations for reference emissions				
Reference emissions during the period p	N/A	1672.09	tCO_2/p	RE_p
Reference emissions	N/A			
CO_2 emission factor for consumed electricity [grid]	Electricity	0.81	tCO_2/MWh	EF_{elec}
CO_2 emission factor for consumed electricity [captive]	Electricity	0.8	tCO_2/MWh	EF_{elec}
Proportion of grid electricity over total electricity consumed at the project site	N/A	1.00	-	-
Proportion of captive electricity over total electricity consumed at the project site	N/A	0.00	-	-
Power consumption of project chiller i	Electricity	1910.00	MWh/p	$EC_{PJ,i,p}$
COP of reference chiller i under the standardizing temperature conditions	N/A	5.59	-	$COP_{RE,i}$
COP of project chiller i calculated under the standardizing temperature conditions	N/A	6.01	-	$COP_{PJ,tc,i}$
4. Calculations of the project emissions				
Project emissions during the period p	N/A	1554.74	tCO_2/p	PE_p
Project emissions	N/A			
CO_2 emission factor for consumed electricity [grid]	Electricity	0.81	tCO_2/MWh	EF_{elec}
CO_2 emission factor for consumed electricity [captive]	Electricity	0.8	tCO_2/MWh	EF_{elec}
Proportion of grid electricity over total electricity consumed at the project site	N/A	1.00	-	-
Proportion of captive electricity over total electricity consumed at the project site	N/A	0.00	-	-
Power consumption of project chiller i	Electricity	1,910.00	MWh/p	$EC_{PJ,i,p}$

[List of Default Values]

$COP_{RE,i}$ (x<300USRt)	4.92	-
$COP_{RE,i}$ (300≦x<450USRt)	5.33	-
$COP_{RE,i}$ (450≦x<500USRt)	5.59	-
$COP_{RE,i}$ (500≦x<700USRt)	5.85	-
$COP_{RE,i}$ (700≦x<1250USRt)	5.94	-

$TD_{cooling}$	1.50	degree Celsius
$TD_{chilled}$	1.50	degree Celsius

Monitoring Structure Sheet [Attachment to Project Design Document]

Responsible personnel	Role
Plant Manager	**[The case for use of measuring equipment]** Responsible for project planning, implementation, monitoring results and reporting. **[The case for auto data collection]** Responsible for project planning, implementation, monitoring results and reporting.
Supervisor	**[The case for use of measuring equipment]** Appointed to be in charge of confirming the archived data after being checked and corrected when necessary. Also, appointed to be in charge of monitoring procedure (data collection and storage), including monitoring equipments and calibrations, and training of monitoring. **[The case for auto data collection]** Appointed to be in charge of confirming the archived data that are collected and provided by auto data collection system (the system) after being checked and corrected when necessary. Also, appointed to be in charge of monitoring procedure (data collection/storage and data sharing with manufacturer), including monitoring equipments and calibrations, and
Chiller Operator	**[The case for use of measuring equipment]** Appointed to be in charge of direct checking of the archived data for irregularity and lack and data collection periodically. **[The case for auto data collection]** Appointed to be in charge of direct checking of the archived data for irregularity and lack, in order for cross checking of data collected by the system.