JCM Project Design Document Form

A. Project description

A.1. Title of the JCM project

Energy Saving for Air Conditioning & Facility Cooling by High Efficiency Chiller (Dhaka Suburbs)

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 facility cooling by introducing high-efficiency centrifugal chillers in a sugar refinery in Bangladesh. The sugar refinery needs considerable energy, and chillers consume significant amount of energy in the refinery. The proposed project covers two sugar refinery factories of City Sugar Industries Limited in Rupshi, Rupgonj, Narayangonj District, Dhaka Division in Bangladesh. The refinery introduced high efficiency centrifugal chiller from split type air-conditioning equipment and increased the energy efficiency in air conditioning. For this, existing 47 units of air-conditioning equipment were replaced with two 220 USRt high-efficiency centrifugal chillers. The chillers were installed in December 2015 and started its operation in 1th February 2016.

A.3. Location of project, including coordinates

Country	Bangladesh
Region/State/Province etc.:	Dhaka Division
City/Town/Community etc:	Narayangonj District
Latitude, longitude	N 23°45'03", E 90°30'59"

A.4. Name of project participants

The People's Republic of Bangladesh	City Sugar Industries Limited (Focal Point (2))
Japan	Nippon Koei Co., Ltd. (Focal Point (1)) Ebara Refrigeration Equipment & Systems Co., Ltd.

A.5. Duration

Starting date of project operation	01/02/ 2016
Expected operational lifetime of project	10 years

A.6. Contribution from Japan

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. As for technology transfer, Ebara Refrigeration Equipment & Systems Co., Ltd. (ERS) has provided the following supports to City Sugar Industry Limited and Green Energy Engineering BD Limited.

To City Sugar Industry Limited:

- Direct instruction on proper operation, and
- Efficient periodical checks to maintain efficiency of the chiller through remote monitoring system

To Green Energy Engineering BD Limited:

Training of four staff in Ebara Factory in Fujisawa, Japan for the appropriate maintenance and operation of high-efficiency centrifugal chillers

B. Application of an approved methodology(ies)

B.1. Selection of methodology(ies)

Selected approved methodology No.	BD_AM001
Version number	Ver2.0

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

Eligibility criteria	Descriptions specified in the methodology	Project information
Criterion 1	Project chiller is a centrifugal chiller with a capacity of less than 1,150 USRt. * 1 USRt = 3.52 kW	Two units of project chiller are centrifugal chillers with a capacity of 220 USRt each.
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.	COP of all the two units of project chillers are 6.03.

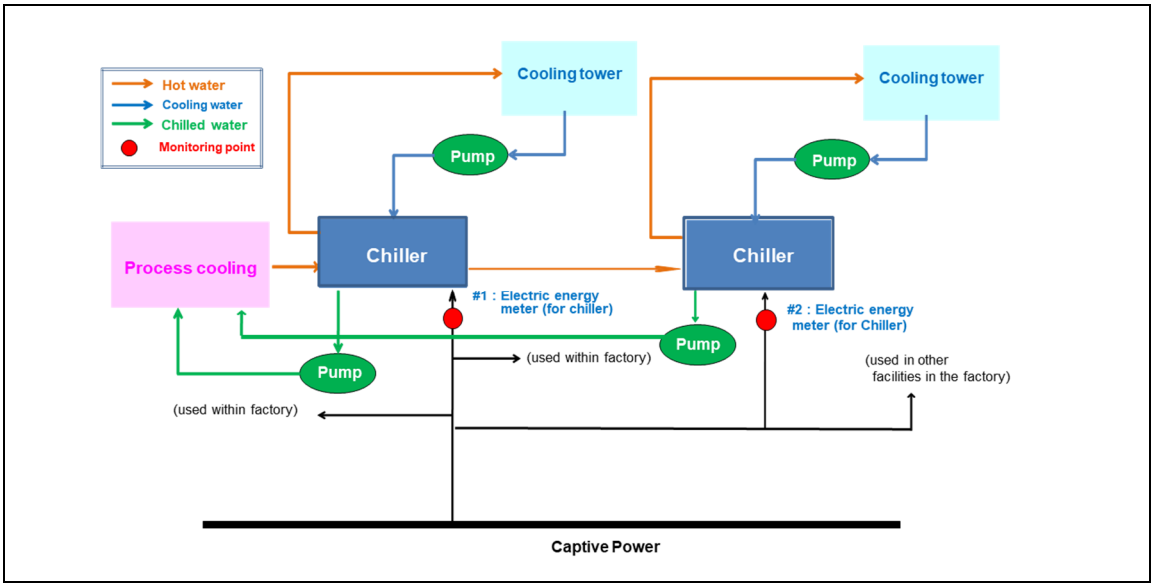
	[equation to calculate $COP_{PJ,tc,i}$] $\mathbf{COP_{PJ,tc,i}} = \mathbf{COP_{PJ,i}} \times [(\mathbf{T_{cooling-out,i}} - \mathbf{T_{chilled-out,i}} + \mathbf{TD_{chilled}} + \mathbf{TD_{cooling}}) \div (\mathbf{37 - 7} + \mathbf{TD_{chilled}} + \mathbf{TD_{cooling}})]$ $COP_{PJ,tc,i}$: COP of project 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 Celsiu, input 32 degree Celsius	
Criterion 3	Periodical check is conducted at least twice a year.	ERS or his representative will conduct periodical check twice a year.
Criterion 4	Ozone Depletion Potential (ODP) of the refrigerant used for project chiller is zero.	ODP of HFC-245fa used in the project chiller is zero.
Criterion 5	A plan for not releasing refrigerant used for project chiller is prepared. In the case of replacing the existing chiller with the project chiller, a plan is prepared in which refrigerant used in the existing chiller is not released to the air e.g. re-use of the refrigerant. Execution of the prevention plan is checked at the time of verification, in order to confirm that refrigerant used for the existing one replaced by the project is not released to the air.	City Sugar Industry agreed to prepare Letter of Consent not to release refrigerant of existing equipment and project chiller.

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)
2013	-	-	-
2014	-	-	-
2015	-	-	-
2016	307.6	261.8	45
2017	390.8	332.5	58
2018	448.5	381.6	66
2019	723.3	615.5	107
2020	723.3	615.5	107

2021	723.3	615.5	107
2022	723.3	615.5	107
2023	723.3	615.5	107
2024	723.3	615.5	107
2025	723.3	615.5	107
2026	-	-	-
2027	-	-	-
2028	-	-	-
2029	-	-	-
2030	-	-	-
Total (tCO_2e)			918

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

PP identified following stakeholders accommodating the suggestions from Bangladesh JCM Secretariat.

[Direct stakeholders] Factory staff related to chiller operations, namely the Factory Director, supervisors and chiller operators.

[Indirect stakeholders] Staff of Department of Environment of Bangladesh

The PP conducted a local stakeholder consultation and additional communications with the direct stakeholders with the support of the agent of chiller manufacturer in Bangladesh (see table below).

#	Date	Venue	Method
1	Feb. 16, 2016	Meeting room in the library of Department of Environment, Bangladesh	Local Stakeholder Consultation
2	Sept.-Oct., 2016	Through e-mail communications	Telephone and face-to-face communication between the direct stakeholders and the agent of chiller manufacturer in Bangladesh

E.2. Summary of comments received and their consideration

Stakeholders	Comments received	Consideration of comments received

City Sugar Staff	The chiller operation is satisfactory. No difficulty is found in operating the chiller. Operators are trained in the project to operate the chiller properly. Energy saving and CO_2 reduction is good for the environment and country. They would like to support the JCM by Japan and Bangladesh government.	No action is necessary.
DOE	High efficiency chiller project should be registered as soon as possible as the first JCM project in Bangladesh	PPs make their best to have the project registered.

F. References

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

Annex

Revision history of PDD		
Version	Date	Contents revised
1.0	13/01/2017	
2.0	21/11/2018	B. Application of an approved methodology(ies) is revised to AM001 ver 2.0. C.3. Estimated emissions reductions in each year was revised accordingly.