JCM Proposed Methodology Form

Cover sheet of the Proposed Methodology Form	

Form for submitting the proposed methodology

Host Country	Vietnam
Name of the methodology proponents submitting this form	JAPAN NUS CO., LTD.
Sectoral scope(s) to which the Proposed Methodology applies	1. Energy Industries
Title of the proposed methodology, and version number	Grid Connected Co-generation Project using Bagasse in Sugar Factory
List of documents to be attached to this form (please check):	☐The attached draft JCM-PDD: ☐Additional information
Date of completion	

History of the proposed methodology

Version	Date	Contents revised

A. Title of the methodology

Grid Connected Co-generation Project using Bagasse in Sugar Factory

B. Terms and definitions

Terms	Definitions
Bagasse	Bagasse is the fibrous matter which remains after sugarcane are crashed to extract their juice. It can be used as a kind of biomass fuel.
Co-generation	Co-generation is to use a heat engine or power generating plant to simultaneously generate electricity and produce useful heat. It is also called as CHP (Combined Heat and Power).
Co-generation using bagasse	In the co-generation project, bagasse is used as a fuel.

C. Summary of the methodology

Items	Summary
GHG emission reduction measures	Co-generation system using bagasse which is introduced in a sugar factory by the project generates electricity and produce useful heat. The co-generation system supplies a part of the generated electricity and all of the produced heat to the sugar factory. Most of the electricity supplied to the power grid. Therefore, the electricity supplied to the grid by the project replaces grid electricity and it result in the GHG emission reductions from the grid. The heat produced by the project may reduce the GHG emission reductions by replacing the heat produced by fossil fired boilers in the factory. But the replacement of heat by the project is not considered for conservativeness and simplification in this methodology. In addition, most of the sugar factories in Vietnam use bagasse-fired boiler to supply steam to their sugar

	production process. That is the reason why the GHG emission reductions from the replacement of fossil fuel fired boilers are not considered in this methodology.
Calculation of reference emissions	Reference emissions are calculated based on the net electricity supplied to the grid of the electricity generated by the project and CO_2 emission factor of the Vietnamese national grid to which the co-generation system by the project connects in a year.
Calculation of project emissions	Project emissions are caused from the fossil fuel which is used to support the combustion of bagasse at the start-up of bagasse fired boiler.
Monitoring parameters	The quantity of the electricity supplied to the grid by the project is monitored.

D. Eligibility criteria

This methodology is applicable to projects that satisfy all of the following criteria.

Criterion 1	The bagasse used as fuel by the project shall be a waste from the sugar factory which is the project site. It shall not include municipal wastes or the other wastes. Fossil fuels can be used as an ignition accelerator and the amount of them is lower than 5% of the bagasse on the basis of calorific value.
Criterion 2	The project includes the installation of new co-generation system, capacity expansion of existing co-generation system, and/or replacement of existing co-generation system. If the project site has an existing co-generation system, the project must expand the capacity of power generation more than the original capacity.
Criterion 3	The bagasse used as fuel by the project shall not be stored for more than a year in order to avoid the fermentation of bagasse under anaerobic conditions and the succeeding release of methane gases.
Criterion 4	The project must not only supply electricity and heat to the sugar factory, but also provide most of electricity generated by the project to the grid.
Criterion 5	The pressure of steam from the boiler installed by the project to combust bagasse shall be 10 MPa or more. The temperature of that shall be 520℃ or more.

E. Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Grid electricity generation	CO_2
Project emissions	
Emission sources	GHG types
Fossil fuel as ignition accelerator	CO_2

F. Establishment and calculation of reference emissions

F.1. Establishment of reference emissions

Reference emissions are calculated on the basis of the net electricity generated by the project which is supplied to the grid and the CO_2 emission factor of the grid.

The quantity of electricity supplied to the grid by the project is directly monitored by an electrical power meter. It is also cross-checked by a receipt slip from the company which control the grid.

The CO_2 emission factor of the grid should be referred to the latest version of the CO_2 emission factor of the national grid in Vietnam "Study, definition of Vietnam grid emission factor", published by Department of Meteorology, Hydrology and Climate Change, MONRE and Ozone Layer Protection Centre. If the project does not use it, it should be instructed by the Vietnamese JCM committee.

Some sugar factories may replace fossil-fired boilers to supply steam with co-generation using bagasse. In that case, the project can also reduce GHG emission reductions through the decrease of fossil fuel use by the replacement of fossil fired boilers. But this methodology does not consider such emission reductions in terms of conservativeness and simplification. Most of the sugar factories in Vietnam use bagasse-fired boiler to supply steam to their sugar production process. That is also the reason why the GHG emission reductions from the replacement of fossil fired boilers are not considered in this methodology.

F.2. Calculation of reference emissions

Reference emissions is calculated based on the following formula:

$$RE_y = EG_y * EF_{grid}$$

Where,

RE_y = Reference emissions in year y (tCO_2/year)

EG_y = The quantity of net electricity generated by the project which is Supplied to the grid in year y (MWh/year)

EF_{grid} = CO_2 emission factor for the national grid in Vietnam which is connected by the project (tCO_2/MWh)

G. Calculation of project emissions

Project emissions are caused by the use of fossil fuels as firework fuels to start the bagasse fired boilers introduced by the project. The project emissions are calculated by the following formula;

$$PE_y = \sum_i FC_{i,y} * EF_{Fuel,i,y}$$

Where,

$FC_{i,y}$ = The quantity of fuel type i combusted as ignition accelerator in year y (mass or volume unit/year)

$EF_{Fuel,i,y}$ = CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)

i = Fuel types combusted as ignition accelerator in year y

The CO_2 emission coefficient, EF_{Fuel}, i, y, is defined by the following calculation;

$$EF_{Fuel,i,y} = NCV_{i,y} * EF_{CO2,i,y}$$

Where,

$NCV_{i,y}$ = The weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)

$EF_{CO2,i,y}$ = The weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)

i = Fuel types combusted as ignition accelerator in year y

As for leakage, the increase of fossil fuel use outside of the sugar factory by the project is hard to occur because bagasse is not used as fuel outside of the sugar factory. Therefore, leakage is not considered in this methodology.

H. Calculation of emissions reductions

Emission reductions in year y are calculated by subtracting the project emissions from the reference emissions, based on the following formula:

$$ER_y = RE_y - PE_y$$

Where,

ER_y = Emission reductions in year y (tCO_2/year)

I. Data and parameters fixed *ex ante*

The source of each data and parameter fixed *ex ante* is listed as below.

Parameter	Description of data	Source
EFgrid	CO_2 emission factor for the national grid in Vietnam which is connected by the project	the latest version of the CO_2 emission factor of the national grid in Vietnam "Study, definition of Vietnam grid emission factor", published by Department of Meteorology, Hydrology and Climate Change, MONRE and Ozone Layer Protection Centre
$NCV_{i,y}$	The weighted average net calorific value of the fuel type i in year y	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vo.2 (Energy) of

		the 2006 IPCC Guidelines on National GHG Inventories
$EF_{CO2,i,y}$	The weighted average CO_2 emission factor of fuel type i in year y	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vo.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories