Joint Crediting Mechanism Approved Methodology MM_AM004
"Installation of rice husk power plant in Ayeyarwady region"

A. Title of the methodology

Installation of rice husk power plant in Ayeyarwady region, version 01.0

B. Terms and definitions

Terms	Definitions
Rice husk power plant	A biomass power plant which consists of a biomass boiler, a generator set (genset) and auxiliary equipment. The biomass boiler generates heat by combusting rice husks as its fuel, and the genset uses the heat to generate electricity.
Power generation capacity	Electric output that a genset can generate, which is the installed/rated capacity indicated by the manufacturer.
Power generation efficiency	Ratio of rated electric output to fuel input, which is the theoretical efficiency indicated by the manufacturer. It may also be the product of heat generation efficiency of a biomass boiler (net heat output / fuel input) and power generation efficiency of a genset (rated electric output / heat input), each of which is the theoretical efficiency indicated by the manufacturer. $$Power\ generation\ efficiency\ [\%] = \frac{Rated\ electric\ output}{Fuel\ input}$$ or $$\frac{Net\ heat\ output}{Fuel\ input} \times \frac{Rated\ electric\ output}{Heat\ input}$$
Recipient facility	A facility (e.g., building, plant, etc.) or a cluster of facilities to which electricity generated by a rice husk power plant is supplied.

C. Summary of the methodology

Items	Summary
GHG emission reduction measures	GHG emission reductions can be achieved through the displacement of grid and/or captive electricity by installation and operation of a rice husk power plant.
Calculation of reference emissions	Reference emissions are calculated from net electricity generation by the project which replaces grid electricity and/or captive use where the project is implemented during a given time period.
Calculation of project emissions	Project emissions are determined to be zero in this methodology.
Monitoring parameters	Amount of electricity generated by a rice husk power plant.

D. Eligibility criteria

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

Criterion 1	A rice husk power plant is installed in Ayeyarwady region and supplies electricity to the national grid and/or a recipient facility.
Criterion 2	The power generation capacity and power generation efficiency of a rice husk power plant meet the following thresholds. To demonstrate or calculate these values, values stated in catalogs or other information prepared by its manufacturer may be used. **Item / Threshold** Power generation capacity — 15 MW or less Power generation efficiency — 16.0 % or more

The Criterion 2 threshold table:

Item	Threshold
Power generation capacity	15 MW or less
Power generation efficiency	16.0 % or more

E. Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Grid electricity and/or captive power generation	CO_2
Project emissions	
Emission sources	GHG types

N/A	N/A

F. Establishment and calculation of reference emissions

F.1. Establishment of reference emissions

Reference emissions are calculated based on the net amount of electricity generated by a rice husk power plant which replaces grid electricity and/or captive use where the project is implemented during a given time period.

In general, auxiliary equipment of a rice husk power plant, when in operation, consumes electricity generated by the power plant itself, but all the auxiliary equipment is not always in operation, nor do they operate at maximum load. To ensure conservativeness in this methodology, it is assumed that all the auxiliary equipment operates all the time at theoretically maximum load during a given monitoring period. Hence, the net amount of electricity generated by the rice husk power plant can be calculated lower than the actual case, which leads to net emission reductions.

F.2. Calculation of reference emissions

$$RE_p = NEG_p \times EF_{RE,elec}$$

Where

RE_p : Reference emissions during the period p [tCO$_2$/p]

NEG_p : Net amount of electricity generated by the rice husk power plant during the period p [MWh/p]

$EF_{RE,elec}$: CO$_2$ emission factor of the national grid or that for consumed electricity in the recipient facility [tCO$_2$/MWh]

Determination of NEG_p

$$NEG_p = EG_p - EC_{aux,p}$$

Where

EG_p : Amount of electricity generated by the rice husk power plant during the period p [MWh/p]

$EC_{aux,p}$: Amount of electricity consumed by the auxiliary equipment of the rice husk power plant during the period p [MWh/p]

Determination of $EC_{aux,p}$

$$EC_{aux,p} = RPC_{aux} \times 24(hours/day) \times D_p$$

Where

RPC_{aux} : Total rated power consumption of the auxiliary equipment of the rice husk power plant [MW]

D_p : Number of days during the period p [day/p]

In case where the rice husk power plant is connected to both the national grid and a recipient facility, and the amount of electricity generated by the rice husk power plant and supplied to the national grid is identified, the following equation may be used for calculating the reference emissions by applying the value of $EF_{RE,elec}$ separately to each amount of electricity as instructed in the section I of this methodology.

$$RE_p = RE_{grid,p} + RE_{fac,p}$$
$$RE_{grid,p} = ES_{grid,p} \times EF_{RE,elec}$$
$$RE_{fac,p} = (NEG_p - ES_{grid,p}) \times EF_{RE,elec}$$

Where

RE_p : Reference emissions during the period p [tCO$_2$/p]

$RE_{grid,p}$: Reference emissions from grid electricity generation during the period p [tCO$_2$/p]

$RE_{fac,p}$: Reference emissions from electricity use in the recipient facility during the period p [tCO$_2$/p]

$ES_{grid,p}$: Amount of electricity supplied by the rice husk power plant to the national grid during the period p [MWh/p]

NEG_p : Net amount of electricity generated by the rice husk power plant during the period p [MWh/p]

$EF_{RE,elec}$: CO$_2$ emission factor of the national grid or that for consumed electricity in the recipient facility [tCO$_2$/MWh]

G. Calculation of project emissions

Project emissions are determined to be zero in this methodology.

$$PE_p = 0$$

Where

PE_p : Project emissions during the period p [tCO$_2$/p]

H. Calculation of emissions reductions

$$ER_p = RE_p - PE_p$$

Where

ER_p : Emission reductions during the period p [tCO$_2$/p]

RE_p : Reference emissions during the period p [tCO$_2$/p]

PE_p : Project emissions during the period p [tCO$_2$/p]

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
$EF_{RE,elec}$	CO$_2$ emission factor of the national grid or that for consumed electricity in the recipient facility [tCO$_2$/MWh]. In case the rice husk power plant only connected to the national grid, the project participant applies CO$_2$ emission factor for the grid electricity. In other cases (i.e. the rice husk power plant is connected to the	For grid electricity: PDD of the most recently registered CDM project hosted in Myanmar or the latest version of the "Tool to calculate the emission factor for an electricity system" under the CDM at the time of validation. For captive electricity with

recipient facility), the project participant applies CO_2 emission factor as following:

If the recipient facility in a proposed project activity is connected only to the grid electricity, the project participant applies CO_2 emission factor for the grid electricity.

If the recipient facility in a proposed project activity is connected only to captive electricity, the project participant applies the CO_2 emission factor with lower value except:

- The case when the rice husk power plant connected only to the recipient facility which is connected only to captive electricity. In this case, the project participant applies the CO_2 emission factor for captive electricity;
  or
- The case when the rice husk power plant is connected to both the national grid and the recipient facility, and the amount of electricity generated by the rice husk power plant and supplied to the national grid is identified. In this case, the project participant may apply the CO_2 emission factors respectively as following:
  - For the amount of electricity supplied by the rice husk power plant to the national grid during the period p ($ES_{grid,p}$ [MWh/p]), the project participant applies CO_2 emission factor for the grid electricity.
  - For the rest of the amount supplied by the rice husk power plant during the period p ($NEG_p - ES_{grid,p}$ [MWh/p]), the project participant

diesel fuel: CDM approved small scale methodology AMS-I.A.

For captive electricity with natural gas: 2006 IPCC Guidelines on National GHG Inventories for the source of EF of natural gas, and CDM Methodological tool "Determining the baseline efficiency of thermal or electric energy generation systems version02.0" for the default efficiency for off-grid power plants.

applies CO₂ emission factor for
captive electricity.

If that the recipient facility in a proposed
project activity is connected both grid
electricity and captive electricity or that the
recipient facility in a proposed project
activity is connected neither the national grid
nor captive power generator, the project
participant applies the CO₂ emission factor
with lower value, except the case where the
amount of electricity generated by the rice
husk power plant and supplied to the national
grid is identified. In this case, the project
participant may apply the CO₂ emission
factors respectively as following:

-For the amount of electricity supplied by the
rice husk power plant to the national grid
during the period p ($ES_{grid,p}$ [MWh/p]), the
project participant applies CO₂ emission
factor for the grid electricity.
-For the rest of the amount supplied by the
rice husk power plant during the period p
($NEG_p - ES_{grid,p}$ [MWh/p]), the project
participant applies CO₂ emission factor
according to the instruction above.

[CO₂ emission factor]
For grid electricity: The value available from
PDD of the most recently registered CDM
project hosted in Myanmar or the calculated
value using the latest version of the "Tool to
calculate the emission factor for an
electricity system" under the CDM at the
time of validation.
For captive electricity: In case the captive

	electricity is solely generated by diesel fuel, apply 0.8 [tCO$_2$/MWh][*1], otherwise (regardless of the energy sources) apply 0.46 [tCO$_2$/MWh] [*2] *1 The most recent value available from CDM approved small scale methodology AMS-I.A. at the time of validation is applied. *2 The value is calculated with the lower value of default effective CO$_2$ emission factor for natural gas (0.0543tCO$_2$/GJ) and the default efficiency for advanced off-grid gas turbine systems (42%).	
RPC_{aux}	Total rated power consumption of the auxiliary equipment of the rice husk power plant [MW]	Specification of all the auxiliary equipment included in the rice husk power plant, provided by the manufacturer.

History of the document

Version	Date	Contents revised
01.0	16 January 2020	Electronic decision by the Joint Committee Initial approval.