

JCM proposed methodology and its attached sheet are preliminary drafts and have neither been officially approved under the JCM, nor are guaranteed to be officially approved under the JCM.

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	Kyushu Electric Power Co., Inc., Voith Fuji Hydro K.K.
Sectoral scope(s) to which the Proposed Methodology applies	Energy industries (renewable- / non-renewable sources)
Title of the proposed methodology, and version number	Title: Grid-connected electricity generation from hydropower projects Version number:01.0
List of documents to be attached to this form (please check):	<input type="checkbox"/> The attached draft JCM-PDD: <input type="checkbox"/> Additional information
Date of completion	February 16, 2015

History of the proposed methodology

Version	Date	Contents revised

A. Title of the methodology

Grid-connected electricity generation from hydropower projects

B. Terms and definitions

Terms	Definitions
Total efficiency	The product of turbine efficiency and generator efficiency.
Auxiliary equipment	Equipment necessary for operating turbine and/or generator such as Governor, AVR, etc.
Control system	System which controls turbine and generator.
Guide vane operation	Open-close operation of guide vane used for controlling discharge of turbine.
Electrical servo motor	Servo motor for guide vane operating composed of electric motor and power cylinder. Electrical motor operates power cylinder and power cylinder converts the rotary motion to linear motion.
Hybrid servo motor	Servo motor for guide vane operating, directly operated by oil pressurized by reversible pump.

C. Summary of the methodology

Items	Summary
<i>GHG emission reduction measures</i>	Electricity to the grid from the hydropower project is generated as an alternative energy of electricity generation in fossil fuel fired power plants, and CO2 emissions corresponding to the electricity generation are reduced.
<i>Calculation of reference emissions</i>	CO2 emissions are to be calculated based on the estimated consumption of fossil fuel in the power plants that are connected to the grid.
<i>Calculation of project emissions</i>	Zero or emissions of CH4 from reservoir are to be calculated.
<i>Monitoring parameters</i>	Generated electricity supplied to the grid.

D. Eligibility criteria

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

Criterion 1	Supply grid with electricity
Criterion 2	Presentation of documents certifying turbine and generator efficiency
Criterion 3	Long-term durability of turbine and generator
Criterion 4	Presentation of operation and maintenance manual and drawings. In addition, having experience of making those things
Criterion 5	Applying for guide vane operation using electric servo system (unit output not more than about 20MW) or hybrid servo system (unit output not more than about 50MW). In addition, having experience of making those system

E. Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Combustion of fossil fuels in grid-connected power plants	CO2
Project emissions	
Emission sources	GHG types
Emissions of CH4 from reservoir	CH4

F. Establishment and calculation of reference emissions

F.1. Establishment of reference emissions

This JCM methodology is to be applied to the hydropower projects that generate electricity and supply to customers via the national grid. For the buyers of electricity, supplied electricity by the project activity is regarded to be replacement of the electricity generated by grid-connected power plants.

CO₂ emissions from electricity generation in fossil fuel fired power plants are regarded as the reference emissions.

F.2. Calculation of reference emissions

$$RE_y = EG_{PJ,y} \times EF_y$$

Where:

RE_y Reference CO₂ emissions in year y [tCO₂/y]

EG_{PJ,y} Quantity of net electricity generation that is produced and fed to the national grid as a result of the implementation of the project activity in year y [MWh/y]

EF_y CO₂ emission factor of electricity in year y = 0.5603 [tCO₂/MWh]

G. Calculation of project emissions

$$PE_y = PE_{HP,y}$$

Where:

PE_y Project emissions in year y [tCO₂/y]

PE_{HP,y} Project emissions from water reservoirs of hydropower plants in year y [tCO₂/y]

The power density (PD) of the project activity is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$

Where:

PD Power density of the project activity [W/m²]

Cap_{PJ} Installed capacity of the hydro power plant after the implementation of the project activity [W]

Cap_{BL} Installed capacity of the hydro power plant before the implementation of the project

activity [W]. For new hydro power plants, this value is zero

A_{PJ} Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full [m²]

A_{BL} Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full [m²]. For new reservoirs, this value is zero

(a) If the power density of the project activity or in case of integrated hydro power project is greater than 4 W/m² and less than or equal to 10 W/m²

$$PE_{HP,y} = \frac{EF_{Res} * EG_{PJ,y}}{1000}$$

Where:

EF_{Res} Default emission factor for emissions from reservoirs of hydro power plants
= 90 [kgCO₂/MWh]

EG_{PJ,y} Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y [MWh/y]

(b) If the power density of the project activity is greater than 10 W/m²

$$PE_{HP,y} = 0$$

H. Calculation of emissions reductions

$$ER_y = RE_y - PE_y$$

Where:

ER_y GHG reduction in year y [tCO₂/y]

RE_y Reference emissions in year y [tCO₂/y]

PE_y Project emissions in year y [tCO₂/y]

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
EFy	CO2 emission factor of electricity in year y = 0.5603 [tCO2/MWh]	MONRE ("Vietnam electricity emission factor", published in 2014/4/21)
EFRes	Default emission factor for emissions from reservoirs of hydro power plants = 90 [kgCO2/MWh]	ACM0002 (Large-scale Consolidated Methodology of CDM)