Joint Crediting Mechanism Project Design Document Form

A. Project description

A.1. Title of the JCM project

Installation of 5MW solar PV system and 3.6MWh battery energy storage system in Zavkhan Province

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

As a part of Upscaling Renewable Energy Sector Project financed by Asian Development Bank (ADB), this proposed JCM project, supported by the Japan Fund for the Joint Crediting Mechanism (JFJCM), has installed a 5 MW solar PV system, 3.6 MWh battery energy storage system (BESS), and energy management system (EMS) in Zavkhan Province. This JCM project is the first in Mongolia to install battery storage systems for utility-scale renewable energy generation. The electricity generated by this solar PV system is charged to the BESS via the grid every day during the day, and the rest of the electricity is supplied to the grid. The electricity charged in the BESS is supplied to the grid at night when solar PV does not generate electricity. The BESS and the solar PV system are located about 30 km apart via the grid. The operation of the installed renewable energy system started on November 1, 2022.

A.3. Location of project, including coordinates

Country	Mongolia
Region/State/Province etc.:	Zavkhan Province
City/Town/Community etc:	Solar power plant: Aldarkhaan District BESS: Uliastai District
Latitude, longitude	PV Location Uliastai: 47°35'53.4"N 96°28'38.7"E BESS Location : 47°43'28.7"N 96°50'54.1"E

A.4. Name of project participants

Mongolia	Ministry of Energy Bogd River Hydroelectric Power Plant LLC
Japan	N/A

A.5. Duration

Starting date of project operation	01/11/2022
Expected operational lifetime of project	25 years
Type and duration of crediting period	10 years

Starting date of crediting period (input the information when requesting a renewal of crediting period)	26/11/2022

A.6. Contribution from Japan

The introduction of the solar PV, BESS and EMS of the proposed Project was fully financed by a grant from the JFJCM of ADB, which is a trust fund contributed by the Government of Japan to support the adoption of advanced low-carbon technologies. The state-of-the-art BESS, which has been developed by NGK INSULATORS, LTD. (NGK), and EMS system, which has been developed by JGC CORPORATION (JGC), were introduced in the project. NGK and JGC had also provided training to the O&M team in Bogd River Hydroelectric Power Plant LLC, which will enable the sustainable operation of the project.

B. Application of an approved methodology(ies)

B.1. Selection of methodology(ies)

Selected approved methodology No.	MN_AM004
Version number	Ver. 01.0

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	EMS(s), BESS(s) and a solar PV system(s) are newly installed to replace a grid and/or captive electricity that is sourced at least from, but not limited to, one fossil fuel thermal power unit.	The project newly installs 5MW solar power electricity generation plant and 3.6MWh BESS of the Bogd River Hydroelectric Power Plant LLC located in Uliastai soum and Aldarkhaan District, Zavkhan Province.
Criterion 2	The equipment to monitor the output power of the solar PV system(s) and BESS(s) is installed at the project site.	Electricity meter and pyranometer have been installed at the project site to monitor output power and irradiance respectively.
Criterion 3	The PV modules need to be certified for design qualifications (IEC 61215, IEC 61646 or IEC 62108) and safety qualification (IEC 61730-1 and IEC 61730-2).	The PV modules installed in the project have been certified for IEC 61215, IEC 61730-1 and IEC 61730-2).
Criterion 4	In case the BESS(s) and the solar PV system(s) are not co-located, the transmission loss ratio between the solar PV system(s) and BESS(s) is less than 0.01 based on the transmission loss ratio	This project is to transmit power from a Uliastai PV to Uliastai BESS via the grid. Since the power of electricity is 900 kW and the distance between the two points is

formula derived from Ohm's law as shown below:

$$TR_{grid} = TL_{grid} \div CE_{grid} \div CT_{grid}$$
$$TL_{grid} = PL_{grid} \times CT_{grid}$$
$$PL_{grid} = 3 \times LC_{grid}^2 \times LR_{grid}$$
$$LC_{grid} = CE_{grid} \div LV_{grid}$$
$$LR_{grid} = CR_{grid} \times TD_{grid}$$

Parameter	Description
TR_{grid}	Transmission loss Ratio during the day [-]
TL_{grid}	Transmission Loss during the day [MWh]
PL_{grid}	3-phase Power Loss due to charging [kW]
CT_{grid}	Charging Time to BESS during the day[hour]
LC_{grid}	Line Current [A]
LR_{grid}	Line Resistance [W]
CE_{grid}	Charging Electricity [kW]
LV_{grid}	Line Voltage [kV]
CR_{grid}	Conductor Resistance [W/km]
TD_{grid}	Transmission Distance [km]

30 km, the calculated power loss ratio is small (0.0016), and in this case the transmission loss is considered negligible.

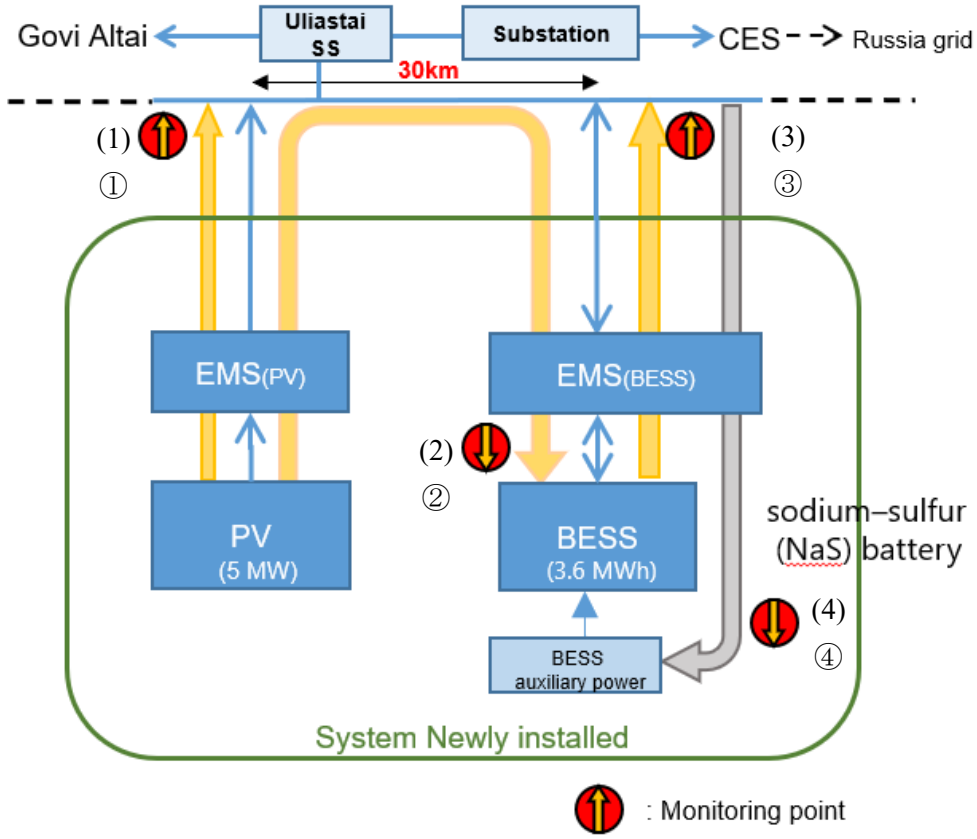
Parameter	This project Value
$\boldsymbol{TR_{grid}}$	0.0016
$\boldsymbol{TL_{grid}}$	5.91 kWh
$\boldsymbol{PL_{grid}}$	1.48kW
$\boldsymbol{CT_{grid}}$	4 hours
$\boldsymbol{LC_{grid}}$	8.2 A
$\boldsymbol{LR_{grid}}$	7.32W
$\boldsymbol{CE_{grid}}$	900kW
$\boldsymbol{LV_{grid}}$	110kV
$\boldsymbol{CR_{grid}}$	0.244W/km
$\boldsymbol{TD_{grid}}$	30km

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
Consumption of grid electricity	CO_2
Project emissions	
Emission sources	GHG type
Generation of electricity from solar PV system	CO_2

C.2. Figure of all emission sources and monitoring points relevant to the JCM project



Monitoring items

(1) Quantity of electricity generated by solar PV system

(2) Quantity of PV-derived electricity sent from the grid to BESS for charging

(3) Quantity of PV-derived electricity discharged from BESS to the grid

(4) Quantity of auxiliary electricity to maintain BESS

Monitoring points

① Electricity generated by solar PV system

② PV-derived electricity sent from the grid to BESS for charging

③ PV-derived electricity discharged from BESS to the grid

④ Auxiliary electricity to maintain BESS

C.3. Estimated emissions reductions in each year

Year	Estimated Reference emissions (tCO_2e)	Estimated Project Emissions (tCO_2e) (*1)	Estimated Emission Reductions (tCO_2e)
2022	629	0	629
2023	6,375	0	6,375
2024	6,375	0	6,375
2025	6,375	0	6,375
2026	6,375	0	6,375
2027	6,375	0	6,375
2028	6,375	0	6,375
2029	6,375	0	6,375
2030	6,375	0	6,375
2031	6,375	0	6,375
2032	5,746	0	5,746
Total (tCO_2e)			63,750

(*1): BESS's auxiliary power was set to zero because the site visit survey confirmed that the estimated emissions of the project are less than 1%, as is the case with the PV site.

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

The project participants posted notices regarding the stakeholders' meeting two weeks prior to the meeting. To complement the process, the project participants also sent out email invitations on 14/10/2024 to tenants in the same office building as the project location.

The stakeholders' meeting was held on 22/10/2024 during 10:00-11:00 hours in the Bogd River Hydroelectric Power Plant LLC office, Uliastai Zavkhan.

Participants:

PMU	[redacted]	on site
Executive Director of Bogd River Hydroelectric Power Plant LLC		
Altai- Uliastai Energy System Chief Engineer		

Ministry of Energy Mongolia	[redacted]	on remote
JCM secretariat in Mongolia		
Environment Officers of the Local Government		on site
ADB / JFJCM Secretariat		on remote
JCM MRV Expert(Pacific Consultants)		on site
Mongolian Interpreter		
Pacific consultants		on remote

E.2. Summary of comments received and their consideration

Stakeholders	Comments received	Consideration of comments received
An expert from Zavkhan Provincial Environment and Tourism Department, in charge of forestry and minerals	The PV is located in Aldarkhaan sum. Does the power supply meet the electricity demand of this village?	(Executive Director of Bogd River Hydroelectric Power Plant LLC) The demand in Uliastai city is 27MW, of which 5MW is supplied by PV.
Executive Director of Bogd River Hydroelectric Power Plant LLC	How long can CO2 emission reductions be accumulated?	(JCM MRV Expert) It can be continued for 10 or 15 years, so it can be continued until 2032 or 2037. Bogd River Hydroelectric Power Plant LLC can decide which one to choose.
An expert from Zavkhan Provincial Environment and Tourism Department, in charge of environmental pollution	There are eight boilers in Uliastai city. Is it possible to measure CO2 reductions using the methods used in this project?	(JCM MRV Expert) The JCM facilities cannot be used for other purposes.

F. References

N/A

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

Annex
N/A

Revision history of PDD		
Version	Date	Contents revised
01.0	10/11/2025	First edition