Joint Crediting Mechanism Approved Methodology MN_AM001
“Installation of energy-saving transmission lines in the Mongolian Grid”

A. Title of the methodology

Installation of energy-saving transmission lines in the Mongolian Grid

B. Terms and definitions

Terms	Definitions
ACSR (existing conductors)	Aluminum Conductors, Coated-Steel Reinforced, whose structure consists of the steel center strand(s), covered by the outer strands of aluminum.
LL-ACSR/SA	Low Electrical Power Loss Aluminum Conductors, Aluminum-Clad Steel Reinforced, which have lower transmission loss compared to ACSR by increasing the area of conductive component.

C. Summary of the methodology

Items	Summary
GHG emission reduction measures	Reduction of transmission loss by introduction of LL-ACSR/SA.
Calculation of reference emissions	Calculation of GHG emission due to transmission loss in ACSR, based on the parameters derived from Mongolian Standard MNS5870: 2008.
Calculation of project emissions	GHG emission due to transmission loss in LL-ACSR/SA, based on monitored transmission loss.
Monitoring parameters	Power sent from the point of origin/supply to the transmission line, power received at the point of receipt of the transmission line, emission factor of the grid, direct current resistance of the transmission line

D. Eligibility criteria

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

Criterion 1	The transmission line constitutes of a single or double circuit(s) directly connecting a substation and another substation within the country with no branching in between, and does not constitute a part of a loop.
Criterion 2	The type of conductor is LL-ACSR/SA, which meets the following technical criteria[1].

Type of energy-saving conductors	unit	Equivalent to LL-ACSR/SA 279/20mm^2	Equivalent to LL-ACSR/SA 337/27mm^2	Equivalent to LL-ACSR/SA 445/36mm^2
Outer diameter of conductor	mm	≦21.6	≦24.0	≦27.5
Direct current resistance (@20degC)	Ω/km	≦0.1063	≦0.0862	≦0.0659
Tensile strength	N	≧75,050	≧90,574	≧120,481
Weight	kg/km	≦921	≦1,132	≦1,490
Corresponding conductors currently in use that forms the basis of calculating the reference emissions.		ACSR 240/32mm^2	ACSR 300/39mm^2	ACSR 400/51mm^2

E. Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Transmission loss in reference scenario	CO_2

[1] Outer diameter and weight are equal or less, tensile strength is equal or more, and direct current resistance is 10% lower than that of existing conductors according to MNS5870: 2008. Direct current resistance is measured according to IEC 60468 (Method of measurement of resistivity of metallic materials) or other relevant national or international standards, and outer diameter, tensile strength and weight are measured according to IEC 62219 (Overhead electrical conductors -Formed wire, concentric lay. stranded conductors) or other relevant national or international standards.

Project emissions	
Emission sources	GHG types
Transmission loss in project	CO_2

F. Establishment and calculation of reference emissions

F.1. Establishment of reference emissions

Reference emissions are calculated by multiplying transmission loss in ACSR ($LOSS_{RF,L}$) by the emission factor of the grid ($EF_{Grid,y}$).
The methodology assures net reductions by introducing a multiple conservativeness assumptions as follows.
The ratio of direct current resistance between ACSR and LL-ACSR/SA, which is in many cases smaller than the ratio of alternative current resistance between ACSR and LL-ACSR/SA, is applied in this methodology.
Furthermore, the ratio of direct current resistance between ACSR and LL-ACSR/SA at the same conductor temperature (20 deg. C.) is applied in this methodology. This ratio is smaller than the ratio of direct current resistance at the same ambient temperature, since the conductor temperature of ACSR would be higher than that of LL-ACSR/SA at the same ambient temperature due to higher resistance of ACSR. Therefore, there is a further element of conservativeness by assuming that conductor temperature is the same between ACSR and LL-ACSR/SA at the same ambient temperature.

F.2. Calculation of reference emissions

Reference emissions are calculated by the following equation.

$$RE_y = \sum_L \left(LOSS_{RF,L,y} \times EF_{Grid,y} \right) \quad (1)$$

$$LOSS_{RF,L,y} = LOSS_{PJ,L,y} \times \frac{Rdc_{RF,L}}{Rdc_{PJ,L}} \quad (2)$$

Where

RE_y	=	Reference emissions during the period of year y [tCO_2/y]
$LOSS_{RF,L,y}$	=	Reference transmission loss at transmission line L in year y [MWh/y]
$EF_{Grid,y}$	=	CO_2 emission factor of the grid in year y [tCO_2/MWh]
$LOSS_{PJ,L,y}$	=	Project transmission loss at transmission line L in year y [MWh/y]
$Rdc_{RF,L}$	=	Direct current resistance of transmission line L using currently used transmission conductors (@20 deg. C) [Ω/km]
$Rdc_{PJ,L}$	=	Direct current resistance of transmission line L using LL-ACSR/SA conductors (@20 deg. C) [Ω/km]

G. Calculation of project emissions

Project emissions are calculated by multiplying transmission loss in the project ($LOSS_{PJ,L}$) by the CO_2 emission factor of the grid ($EF_{Grid,y}$).

$$PE_y = \sum_L \left(LOSS_{PJ,L,y} \times EF_{Grid,y}\right) \quad (3)$$

$$LOSS_{PJ,L,y} = E_{L,send,y} - E_{L,receive,y} \quad (4)$$

Where

PE_y	=	Project emissions during the period of year y [tCO_2/y]
$LOSS_{PJ,L,y}$	=	Project transmission loss at transmission line L in year y [MWh/y]
$E_{L,send,y}$	=	Power sent from the point of origin/supply to the transmission line L in year y [MWh/y]
$E_{L,receive,y}$	=	Power received at the point of receipt of the transmission line L in year y [MWh/y]
$EF_{Grid,y}$	=	CO_2 emission factor of the grid in year y [tCO_2/MWh]

H. Calculation of emissions reductions

Emission reductions are calculated by the following equation.

$$ER_y = RE_y - PE_y \quad (5)$$

Where

ER_y	=	Emission reduction in year y [tCO_2/y]
RE_y	=	Reference emission in year y [tCO_2/y]
PE_y	=	Project emission in year y [tCO_2/y]

I. Data and parameters fixed *ex ante*

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

<table>
<tr><th>Parameter</th><th>Description of data</th><th>Source</th></tr>
<tr><td>$Rdc_{PJ,L}$</td><td>Direct current resistance of transmission line L using LL-ACSR/SA conductors (@20 deg. C)</td><td>Measured according to IEC 60468 (Method of measurement of resistivity of metallic materials).</td></tr>
<tr><td>$Rdc_{RF,L}$</td><td>As described in the following table
<table>
<tr><th>Type of energy-saving conductors</th><th>unit</th><th>Equivalent to LL-ACSR/SA 279/20mm^2</th><th>Equivalent to LL-ACSR/SA 337/27mm^2</th><th>Equivalent to LL-ACSR/SA 445/36mm^2</th></tr>
<tr><td>$Rdc_{RF,L}$ (Direct current resistance at 20degC)</td><td>Ω/km</td><td>0.1158</td><td>0.0939</td><td>0.0718</td></tr>
</table></td><td>Based on MNS5870: 2008[2]</td></tr>
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History of the document

Version	Date	Contents revised
01.0	20 February 2014	JC2, Annex 1 Initial approval.

[2] Allowing for 1% increase in diameter resulting in 2% reduction in direct current resistance as defined by MNS 5870: 2008.