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Study on Calculation Method of Carbon Emission in Utilization of ACCC Conductor in New or Modified Power Lines

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Characters and Advantages of ACCC

ACSR

ACCC

Characters and Advantages of ACCC

Compared with ACSR

- Higher tensile strength
- Lower CTE
- Greater ampacity
- Without Replacing Tower

Characters and Advantages of ACCC

A goal of Pari Climate 2015

2 ℃ compared to pre-industrial levels.

“Pursue efforts to” limit the temperature increase to 1.5 ℃

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Description of Methodology

Baseline emissions (BEy)

$$BE_y = Q_{Line,\ BL,\ y} \times EF_{Elec,y} \quad (1)$$

BE_y——Baseline emissions in year y (tCO2);

$Q_{Line,\ BL,\ y}$——The quantity of line loss at the baseline condition, as a result of the implementation of the CDM project activity, in year y, in accordance with monitoring data (MWh);

$EF_{Elec,\ y}$——CO_2 emission factor of the electric transmitted by grid in year y (tCO_2/MWh).

Description of Methodology

Line losses at baseline scenario (QLine, BL, y)

For single phase circuit

$$Q_{Line,BL,y} = n \frac{\sum_{i=1}^{m_y} \left(I_{PJ,i,y}^2 \right)}{m_y} r_{BL} L_{BL} T_y \Big/ 10^6 \qquad (2)$$

For three-phase lines

$$Q_{Line,BL,y} = 3n \frac{\sum_{i=1}^{m_y} \left(I_{PJ,i,y}^2 \right)}{m_y} r_{BL} L_{BL} T_y \Big/ 10^6 \qquad (3)$$

Description of Methodology

Project emissions (PEy)

$$P_{\mathrm{Ey}} = Q_{Line,\ PJ,\ y} \times EF_{Elec,\ y} \qquad (4)$$

PEy——Project emissions in year y (tCO2);

QLine, PJ, y——The quantity of line loss at the project condition, as a result of the implementation of the CDM project activity, in year y, in accordance with monitoring data (MWh);

EFElec, y——CO2 emission factor of the electric transmitted by grid in year y (tCO2/MWh).

Description of Methodology

Line losses at project scenario (QLine, PJ, y)

For single phase circuit

$$Q_{Line,PJ,y} = n \frac{\sum_{i=1}^{m_y} \left(I_{PJ,i,y}^2 \right)}{m_y} r_{PJ} L_{PJ} T_y \Big/ 10^6 \qquad (5)$$

For three-phase lines

$$Q_{Line,PJ,y} = 3n \frac{\sum_{i=1}^{m_y} \left(I_{PJ,i,y}^2 \right)}{m_y} r_{PJ} L_{PJ} T_y \Big/ 10^6 \qquad (6)$$

Description of Methodology

Emission reductions (ER_y)

$$ER_y = BE_y - PE_y \quad (7)$$

ERy ——Emission reductions in year y (tCO2/y);

BEy——Baseline emissions in year y (tCO2/y);

PEy——Project emissions in year y（tCO2/y).

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Case Analysis-Energy Saving

Transmission line technical parameters

Environmental Parameters:
Sunlight intensity=1026.9W/m^2;
Environmental Temperature=30°C ;
Wind speed=0.6m/s;
Wind direction=90°.
Operating parameters:
Line length (L_{PJ}) =100 km;
Parallel number (n) =1;
Line running time (T_y)=8760 h;
CO_2 emission factor ($EF_{Elec,\ y}$) =0.8 tCO_2/MWh.

Case Analysis-Energy Saving

Item	Unit	Result			
U	kV	35	110	220	500
ACSR Type	-	228-LGJ-120/20	369-LGJ-185/25	592-LGJ-300/40	789-LGJ-400/50
ACCC Type	-	291-148/20	471-239/24	745-378/44	1019-517/44
PE_1	tCO_2	57,294	63,308	141,074	300,529
BE_1	tCO_2	77,187	85,090	181,775	407,123
ER_1	tCO_2	19,893	21,782	40,701	106,594
Reduction ration	-	25.8%	25.6%	22.4%	26.2%

Q & A